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NOVEMBER 4, 1957

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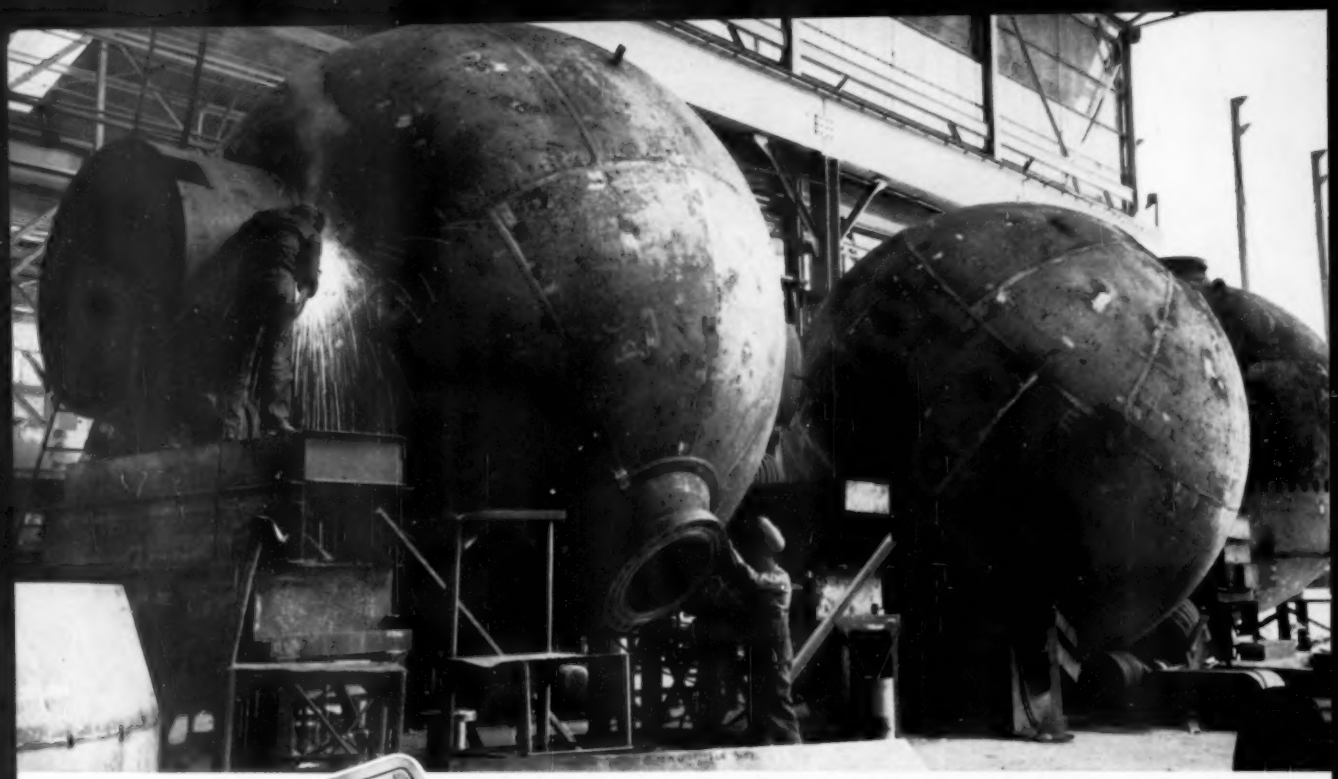

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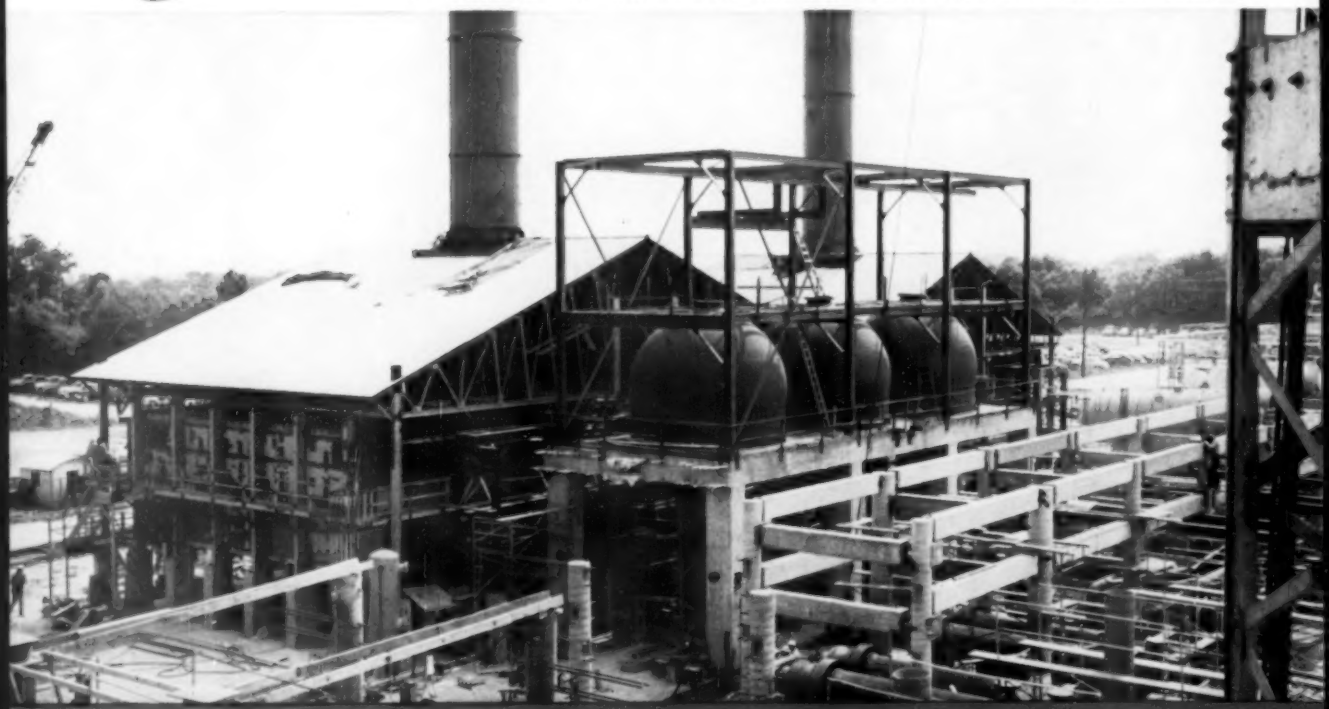


MANUFACTURERS AND ERECTORS SINCE 1913

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Nov. 4, 1957

Oil-company profits, though mixed, still look good:

Many reports now coming in reveal a profit dip for third quarter.

The softness generally is attributed to lower than expected market demand, lower product prices in many instances, plus higher costs of material and labor.

Jersey Standard and Gulf are showing biggest gains for first 9 months. In fact, Jersey is bidding to become the world's top money maker this year. It's 9-month net of $660 million is about 9 per cent higher than that of General Motors, the previous big money maker.

These early reports show the spotty profit trends:

	Nine Months		Per Share	
	1956 (millions)	1957	1956	1957
Gulf	$214.0	$252.0	$6.88	$8.87
Jersey Standard	603.0	660.0	3.07	3.35
Ohio Standard	20.1	14.5	4.06	2.90
Ohio Oil	30.2	32.0	2.31	2.44
Phillips	71.5	74.2	2.08	2.16
Plymouth	5.9	5.6	2.47	2.29
Richfield	20.7	21.7	5.19	5.44
Socony Mobil	183.0	183.0	———	3.87
Sun Oil	39.7	39.01	3.92	3.63

Oil outlook for next year, meanwhile, begins to shape up as steady. Total production is expected to stay close to this year's average.

Production, however, should average 420,000 bbl. a day more than the October rate. Output averaged 6,750,000 bbl. day in October. Next year it will be about 7,195,000 bbl. daily, according to study of special I.P.A.A. committee.

Domestic demand actually will show a 3.3 per cent gain in 1958. This will be overshadowed by a big drop in exports. You must remember the first part of 1957 was unusual because of the heavy crude shipments due to the Suez crisis.

Salary raises for engineers may be slowing down.

Pay levels for engineering, scientific, and administrative employes in American industry rose an average of 5.9 per cent between June 1956 and June 1957, American Management Association reports.

This increase was lower than the 8.6 per cent average pay rise reported for same group the year before.

Median annual salaries currently paid engineers in all fields combined range from $5,400 in beginning category to about $13,100 at highest nonmanagement level.

An all-temperature engine oil is urgently needed by the Armed Forces. Oil experts are being asked to come up with an answer.

What's needed: A lubricating oil permitting vehicles to operate at temperatures ranging from 65° below zero up to 125° above. Such an oil would alleviate serious logistics and supply problems in the field.

Other problems the National Inventors Council is asking petroleum specialists to crack include:

Fluorine-resistant lubricant. This lubricant or corrosion resistant coating should perform adequately in the presence of liquid or gaseous fluorine.

High-temperature lubricants. These should be effective at temperatures as high as 1,000° C.

Gelling agents for gasoline. A gelling agent which will form gels of firm consistency capable of long-term storage under operational conditions. Existing agents form gels which tend to break down after relatively short periods of time in storage.

The Air Force is preparing another asphalt vs. cement test for runway construction.

Oil men claim the tests still will be stacked heavily in favor of concrete because exaggerated, nontypical conditions will be used.

Consequence: More cement runways for Air Force installations in the future in spite of some unhappy past experience and contrary to commercial airport trends which favor asphalt.

Look for some changes in the federal highway program.

Oil industry stands to lose ground in any event.

Costs for the 41,000-mile interstate system now are expected to exceed taxes earmarked for the work. This means Congress has three alternatives: Cut the program, keep it at present mileage but raise gasoline tax, or extend both length of time taken to build the roads and the taxing period.

If program is cut, oil industry will lose part of its expected asphalt and products market the program will supply. If taxes are raised or extended, this will offset some of the

new gasoline market which the new highways are expected to generate (p. 77).

Mercury will have a 400-hp. engine in its top 1958 model. Other models will range from 312 to 360 hp. and all will have 10.5:1 compression ratios.

The new engine will be the hottest on the road, even overtaking Lincoln's 375-hp. motor. The 1957 top was Chrysler Imperial with 325 hp.

A drilling spurt may develop in the Bisti area.

40-acre spacing pattern for the northwestern New Mexico region has been established by the New Mexico Oil Conservation Commission.

Early drilling in Bisti generally was on an unofficial 80-acre pattern. Some Bisti operators wanted to make this official, but the commission order upset the plans.

Total of 161 oil wells have been completed in Bisti proper and northeast of the field. Just how many operators now will go into their leases and drill more wells to conform to 40-acre spacing still is unknown.

Imperial Oil and Pan American Petroleum apparently are putting a lot of store by knowledge gained from Imperial's Neptune wildcat in Boundary Lake area of Alberta.

Prior to releasing data on Neptune tests, Imperial and Pan American teamed to buy 98,726-acre tract to the south for a bonus of $3,903,566. That's nearly twice what Imperial paid for 98,586-acre parcel on which Neptune hole is located.

Heavy spending is being budgeted for Iran. London reports estimated work will cost more than $140 million (p. 102).

Principal projects: $53 million on facilities for stepping up production from Gach Saran field, including $28 million on housing for 1,320 families, roads, airstrips, offices, clubs.

Agha Jari field also will have production substantially increased. This will require new pipeline to the coast and a new loading port at Bandar Mashur for handling supertankers.

Exploration work also will be stepped up. Number of rigs will be raised to nine. Geological, geophysical, and survey parties are to intensify activity throughout the agreement area.

Drilling is picking up again in Citronelle field.

Passage of Alabama's new unitization law is believed responsible. Under the new law approval of only 75 per cent of royalty interests is required for unitization.

Four rigs have been drilling in the area this month. Development virtually had stopped earlier this year.

Exploration notes: Drilling from a floating barge soon

will be conducted for first time in Gulf of Mexico oil hunt. Technique and equipment have been developed by Brown & Root and McClelland Engineers of Houston. They have been proved in exploration work for sulfur companies (p. 92).

New drilling program is virtually assured for eastern Canada's New Brunswick. Imperial Oil has signed agreement with New Brunswick Oilfields for exploring million acres of Crown-leased lands in eastern section of the province.

Rocky Mountain oil men are worried over Interior Department's proposed ban on oil and gas leasing on wildlife refuges.

Big question: How far can Government go in withdrawing public lands for game preserves.

Members of the Rocky Mountain Oil and Gas Association meeting at Billings recently were advised to draw up their objections to the proposed new rules. They have until November 10 to do so.

Oil men who talked with Captain Carson and Herbert Hoover, Jr., on imports during I.P.A.A. sessions in Dallas last week came away with one fixed notion:

The administration's program on imports is set. It's considered fair and flexible, but officials will brook no tinkering with it (p. 82).

A chemical process that helps shut off water in oil wells has been developed by Western Co.

Technique is known as "Selective Water-Seal."

It consists of squeezing a treated oil into the pore spaces of the producing formation. In a water-laden zone, the squeeze fluid creates a water-in-oil emulsion that is a barrier to further movement of water.

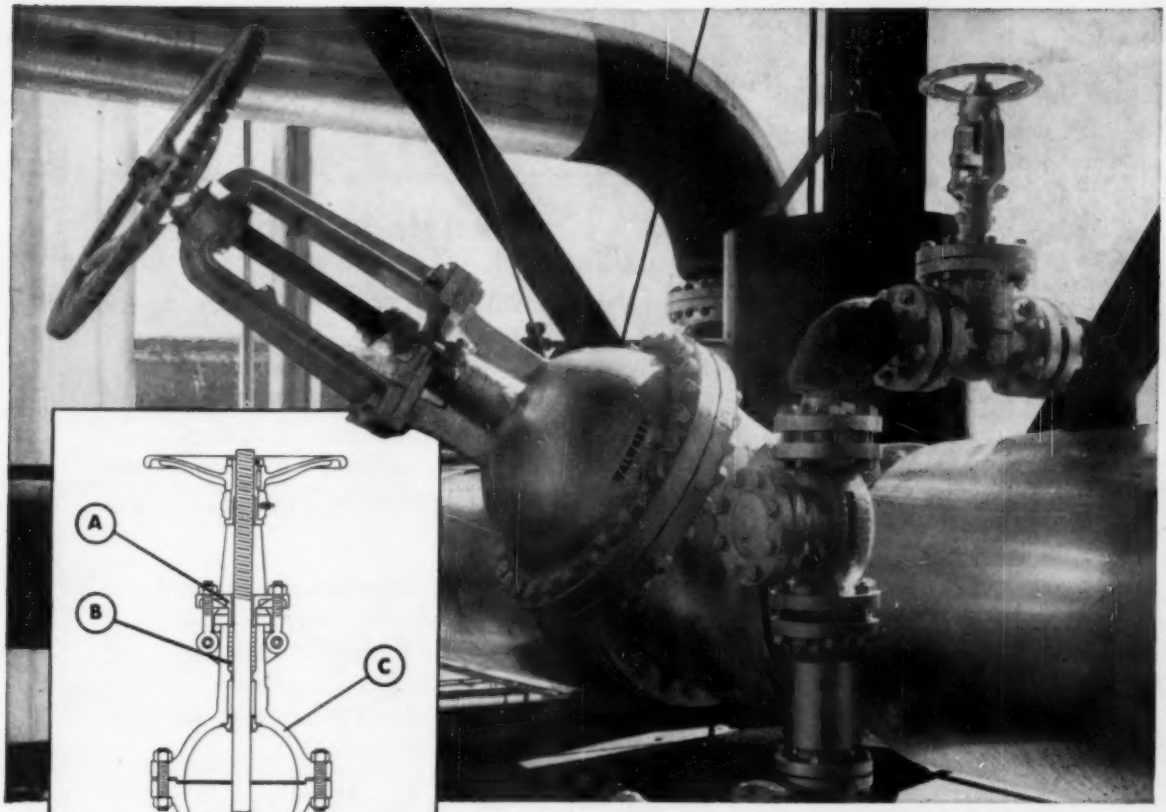
Western says no emulsion is set up in the oil zone so there is no barrier there.

First fully-transistorized computer-data processing system will be used in the oil industry.

Beckman Instruments, Inc., is shipping the new system for installation at Phillips Chemical Co.'s new ethylene plant at Sweeny, Tex. It will process information from 168 pressure sensing elements, measuring both pressure and flow, recording temperatures from 200° below zero to nearly 2,000° F.

Kerr-McGee is buying the 1,100 miles of Gulf's pipeline gathering system in Oklahoma.

The deal apparently is a smart one for both companies. Gulf is unsaddled from a gathering operation that had become uneconomic for it. Kermac on the other hand doubles the size of its gathering system and now will not have to buy crude from outside sources for its two Oklahoma refineries.



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. . . An eight-page special section forecasting supply and demand trends through 1965 will be featured in The Journal's annual pre-A.P.I. issue next week.

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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Geological-Geophysical Report

Oil and Gas in the Gulf Coastal Province . . 109

By Grover E. Murray

Oil or gas occurs in rocks of every age from the Paleozoic to the Recent and in shallow fields to the deepest production in the world. The 77-major oil fields will eventually yield about two-thirds of the total ultimate production of the province, estimated at 23 billion barrels.

Successful Shooting in Delaware Basin 117

By M. G. Trostle

An organized approach to Delaware basin geophysical work has been made based on a knowledge of the characteristics of interference in this area.

Magnetic Data at 100 M.P.H. 125

By W. B. Agocs

Airborne magnetometer surveys can survey an unknown area rapidly and economically; and work into geophysical prospecting program in several other ways.

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Multiple Packers Reduce Number of Injection Wells 135

By L. V. Gefvert, R. C. Chamberlain, and C. E. Wakefield, Jr.

These tools allow selective gas and water injection and provide an effective way to save drilling of multiple injection wells for thick reservoir sections.

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By Dr. John M. Campbell

Record-Breaking Rig Is Electric 157

By J. O. Scott

Rig 26 of Parker Drilling Co. in its first two holes broke both the Oklahoma and Texas depth records. It is electric and the type of rig Parker considers best for deep drilling.

Refining-Processing

Pulverized Coke Fires Clean in First Refinery Use 142

By Joe Brendler

Cities Service Oil Co. is burning up to 160 tons per day of delayed petroleum coke under steam boilers at its East Chicago refinery. Stacks are as clean as those on gas-fired boilers.

A Cheap Way to Remove S from H_2S 144

By G. M. Franklin, L. V. Kunkel, and M. Webb

Small plants, even those with capacities of less than 12 tons per day, will find the new method economical. Plants with capacities up to 50 tons per day may be justified.

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Pipelining

New Device for Launching Pipe in Offshore Operations 154

By Larry Resen

It provides for closer control of the slope of the pipe as it is launched. This protects against cracking the concrete weight coating and buckling of the pipe through excessive bending.

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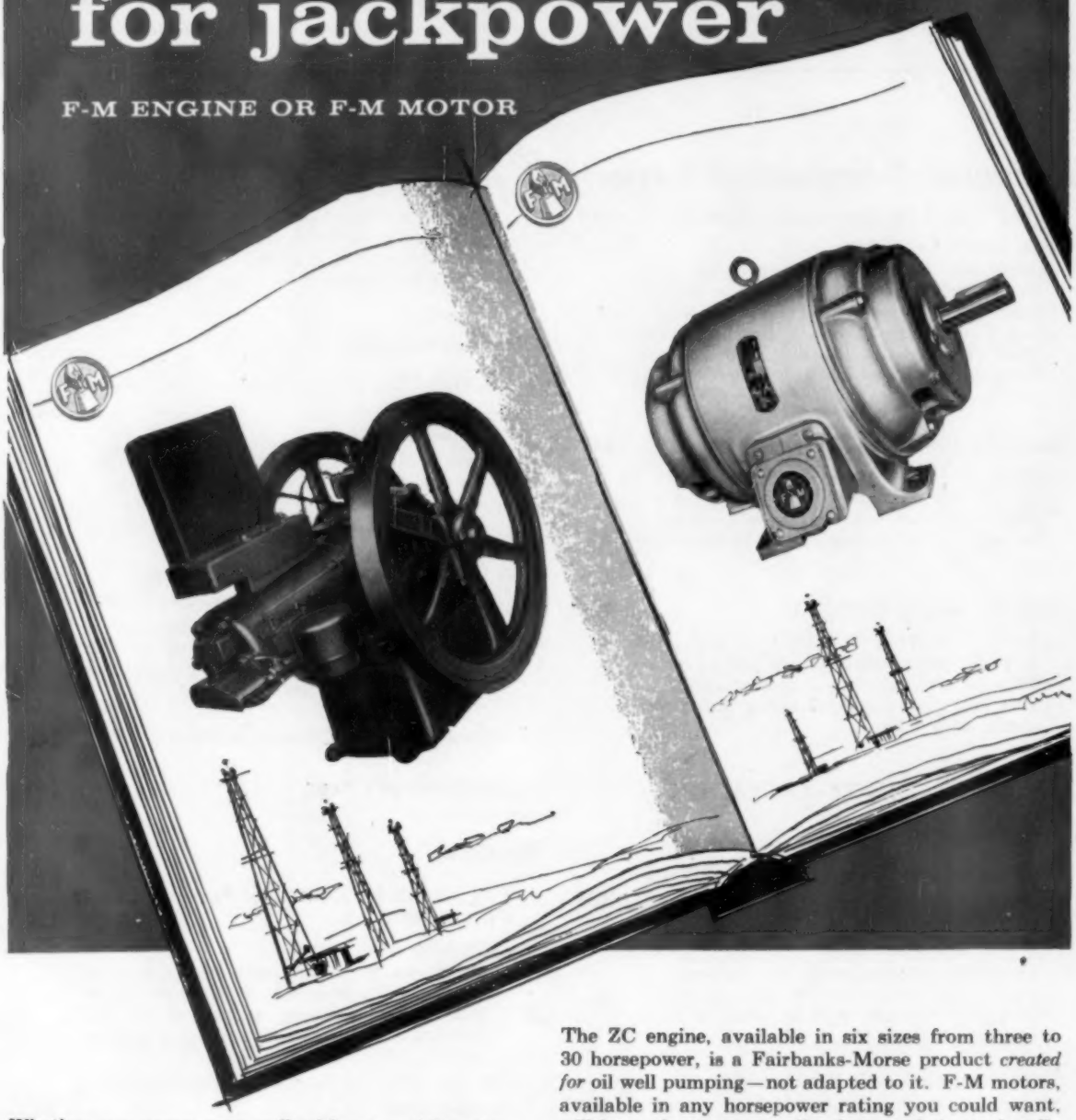

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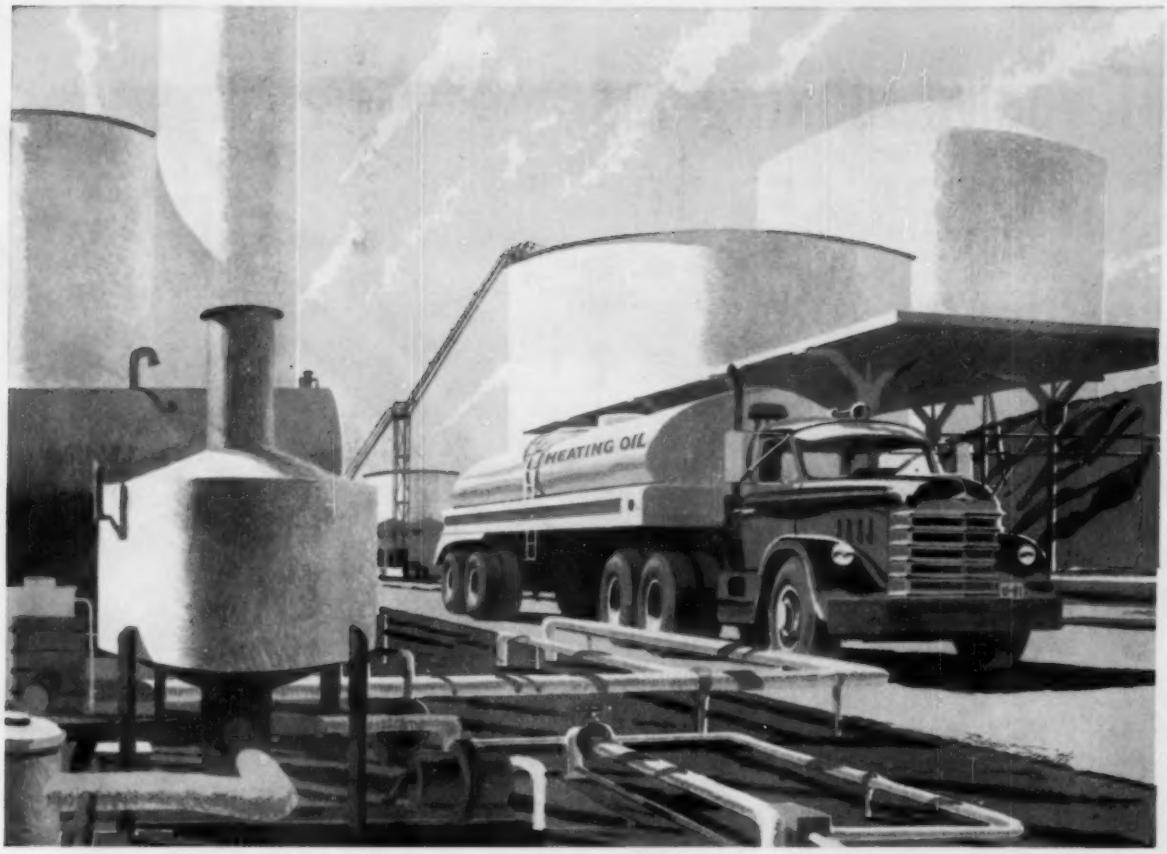

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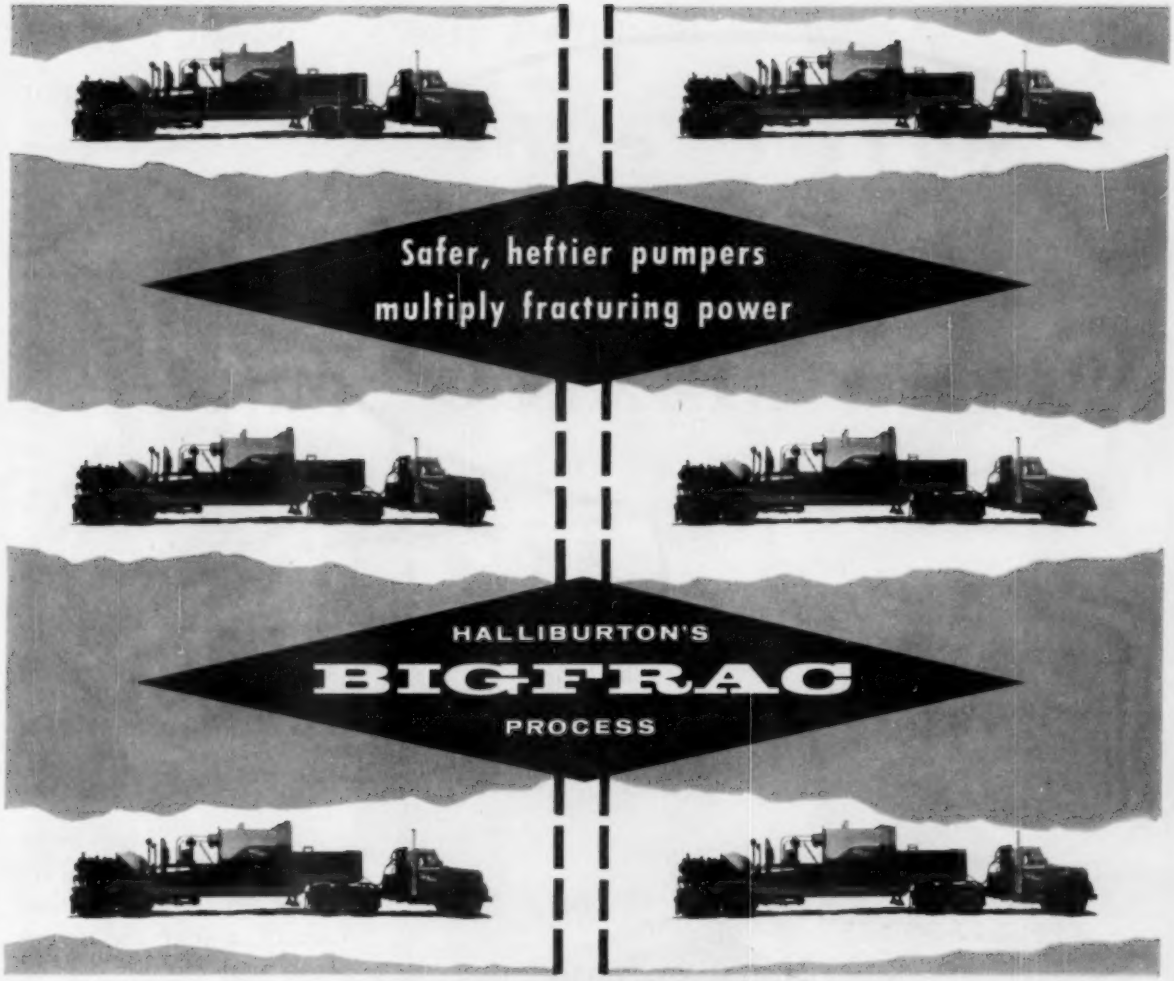

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At Tidewater's new Delaware Refinery...

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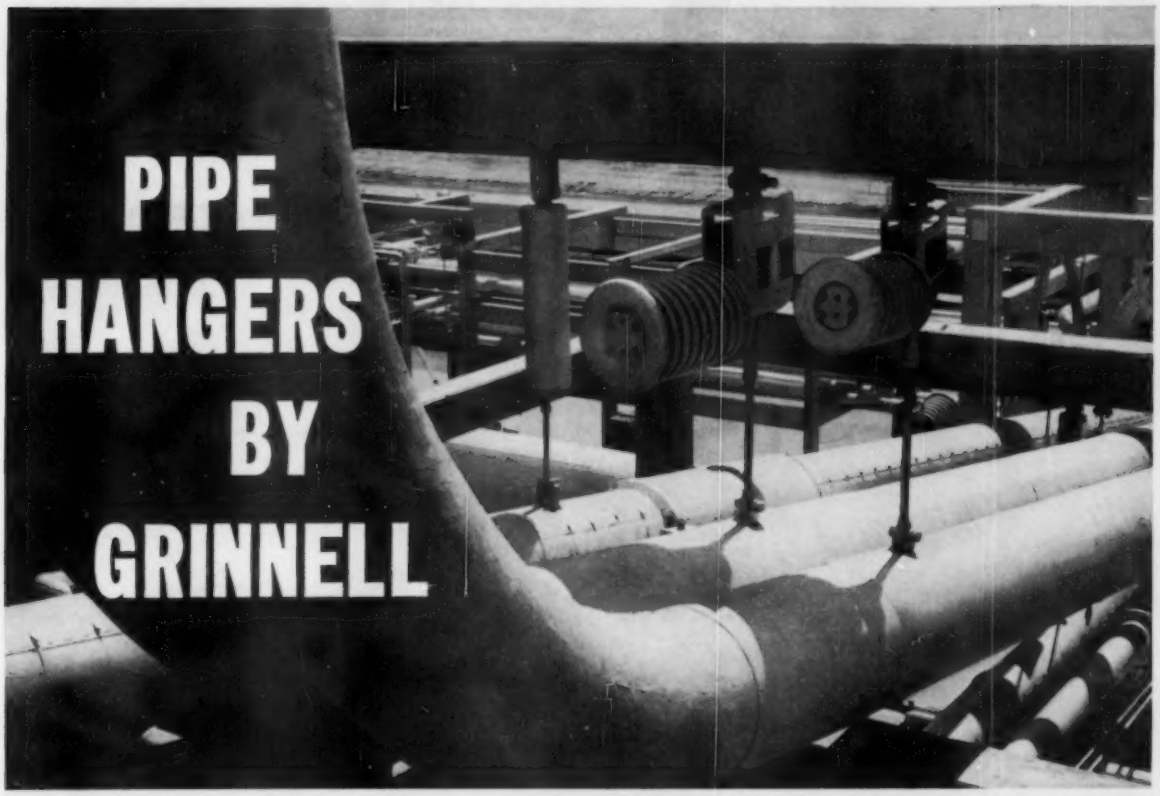

Tidewater Oil Company's new ultramodern $200-million, 5000-acre refinery, south of Wilmington, is the largest ever constructed at one time. Capable of processing 130,000 barrels of crude oil daily, the Delaware Refinery boasts eleven major processing units, including six of world-record size.

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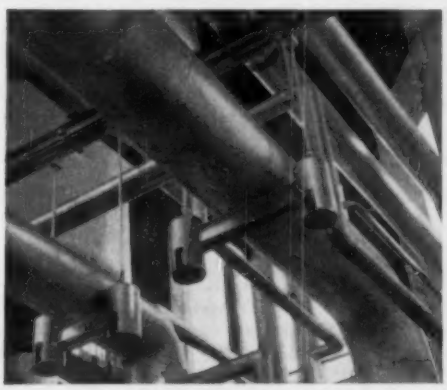

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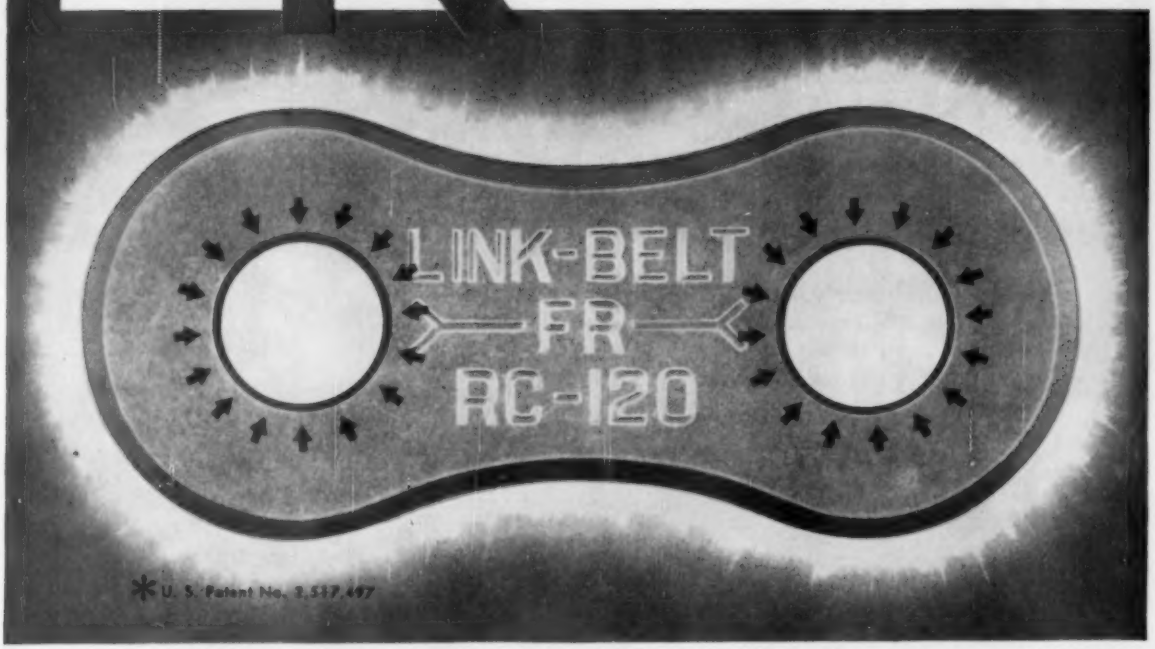
LINK-BELT's answer to endurance demands on roller chain



THIS IS FR. By compressing the metal around pitch holes, Link-Belt greatly strengthens the critical sidebar areas most vulnerable to fatigue failure. This development is the result of Link-Belt roller chain research and unequalled depth of oil field experience.

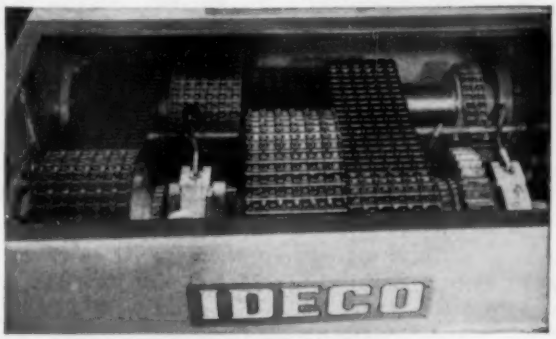
Greater sidebar Fatigue Resistance means greater dynamic strength... increased chain endurance

Today's high drilling speeds, great hook loads and heavy drill collar strings continually create a brute punishment no ordinary roller chain can long withstand. That's why modern rigs need Link-Belt Roller Chain with its vastly superior *dynamic strength* produced by the FR process.

This is just one of many "extras" you get in Link-Belt oil field roller chain. Others include:

- SHOT-PEENED ROLLERS with extra fatigue life.
- PRE-STRESSING for load bearing uniformity.
- E-Z ASSEMBLY to facilitate field installation.
- SHEPHERD'S CROOK COTTERS that won't shake loose.
- DOUBLE BOXING — most effective in the field.

For full information on them all, ask any leading supply store for your copy of Link-Belt Catalog 2780.



IDECO M-2500 3-SPEED TRANSMISSION incorporates Link-Belt FR roller chain—supplied as original equipment.

LINK-BELT

ROLLER CHAINS & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 22 (Montebello), Scarboro, (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14,670

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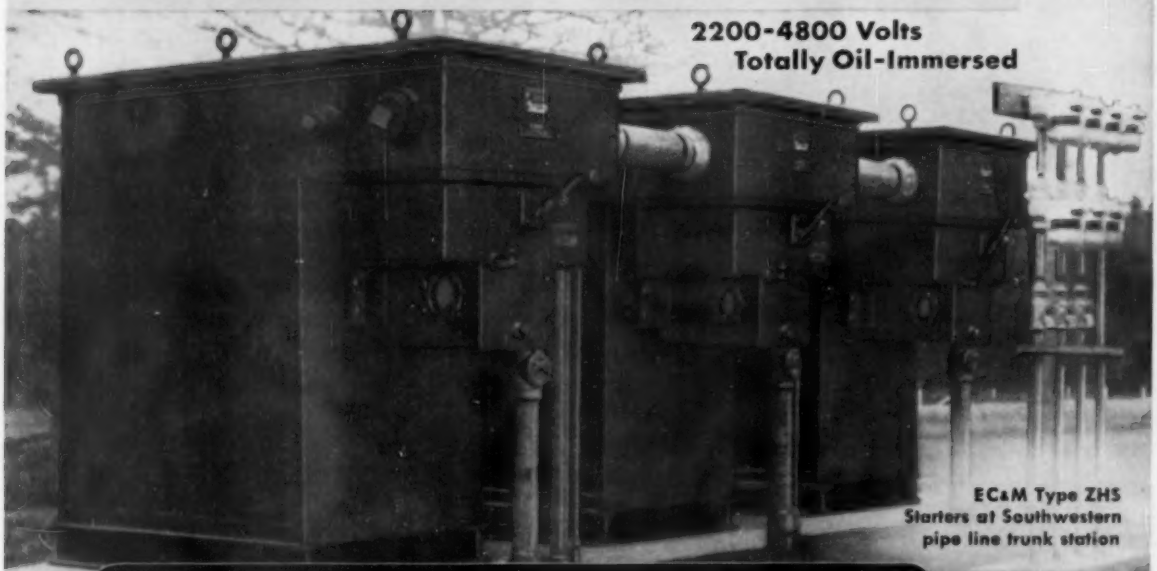
EC&M HIGH VOLTAGE STARTERS

2200-4800 Volts
Totally Oil-Immersed



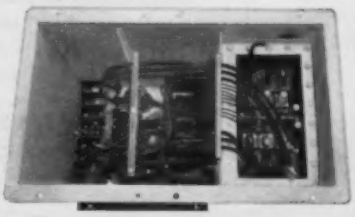
EC&M Type ZHS Starters at Southwestern pipe line trunk station

Designed for Easier Installation, Inspection and Maintenance

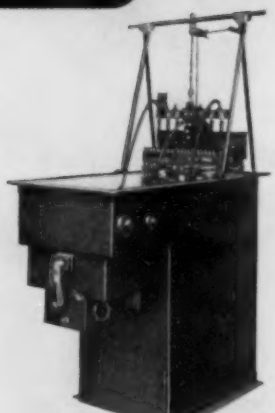
Specifically designed for Class I, Group D, Division 2, semi-hazardous locations . . . NEMA 3R (raintight enclosure). 50,000 KVA interrupting capacity.

***Fast* installation** because starters are shipped with all internal wiring complete. All leads are of anti-syphon construction.

Easy inspection • Contactor and overload relay panel may be raised, as one unit, above oil level. No disconnecting of bolts or leads. *(See lifting mechanism at extreme right.)* Safer, too . . . note view windows on each side of load-break disconnect switch.



View from above shows complete internal wiring . . . anti-syphon leads. These "ready-to-use" starters are complete with control transformer for 220 volt push button operation.



EC&M Contactor lifter raises contactor and overload relay above oil level for easy inspection. No bolts or leads to disconnect.

For literature describing EC&M's complete starter line, write for Bulletin 8131-T

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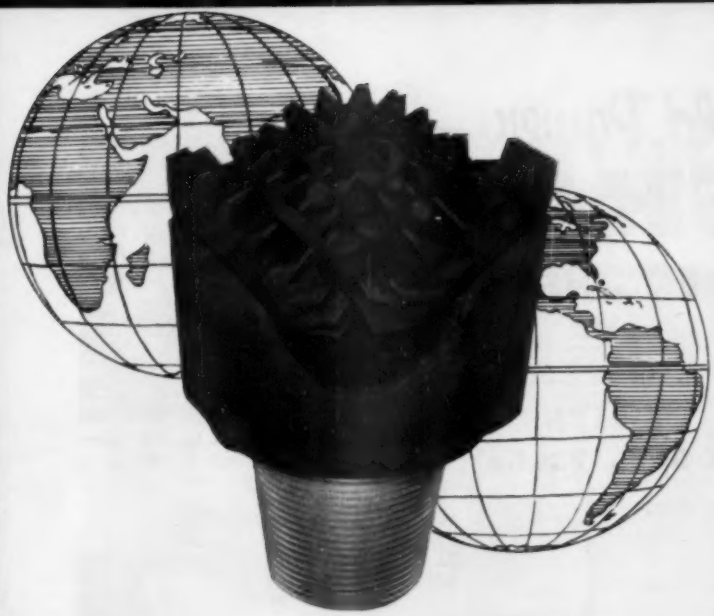

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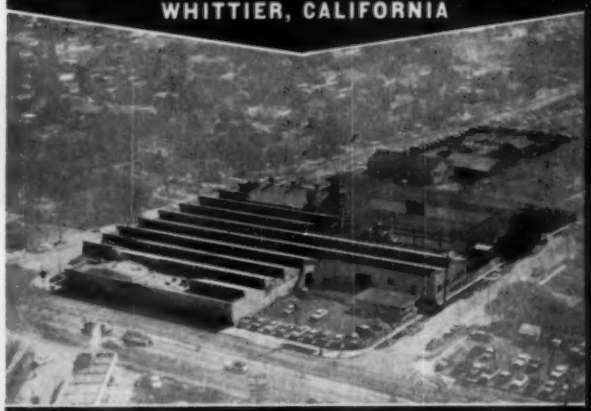

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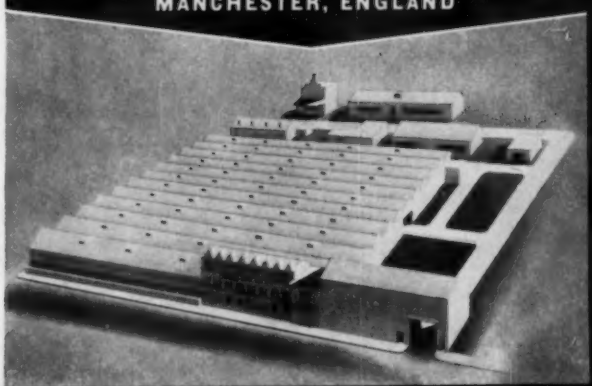

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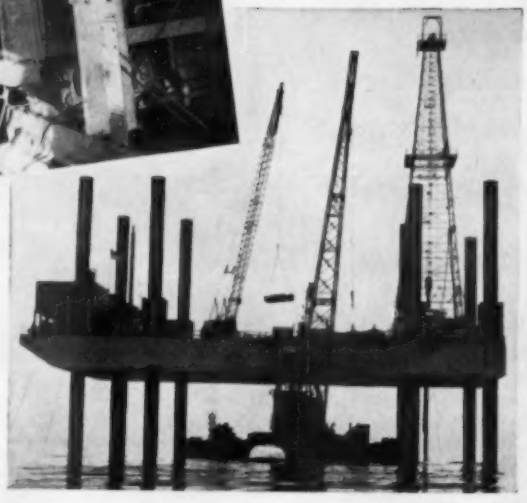

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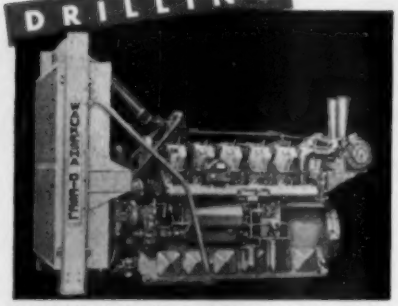
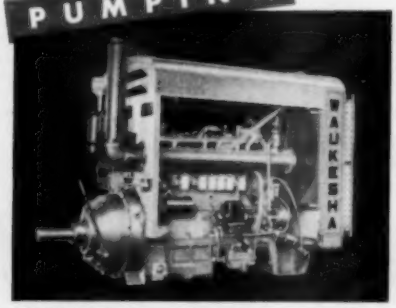
DRILLING



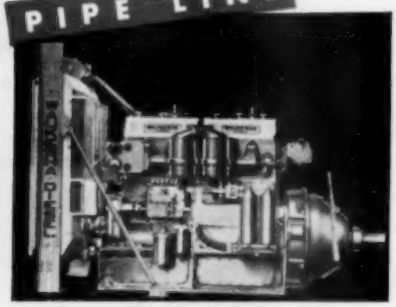
VLRDBSU Turbocharged Diesel Unit—twelve cyl., 8½-in. bore x 8½-in. stroke, 5788 cu. in. displacement, 1190 hp at 1200 rpm.

PUMPING



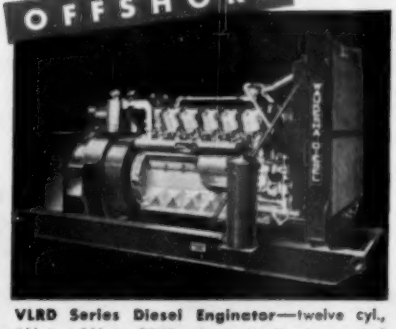
WAKU Special Long Life Unit—six cyl., 6¼-in. bore x 6½-in. stroke, 1197 cu. in., 125 continuous (65%) hp at 1200 rpm.

PIPE LINE



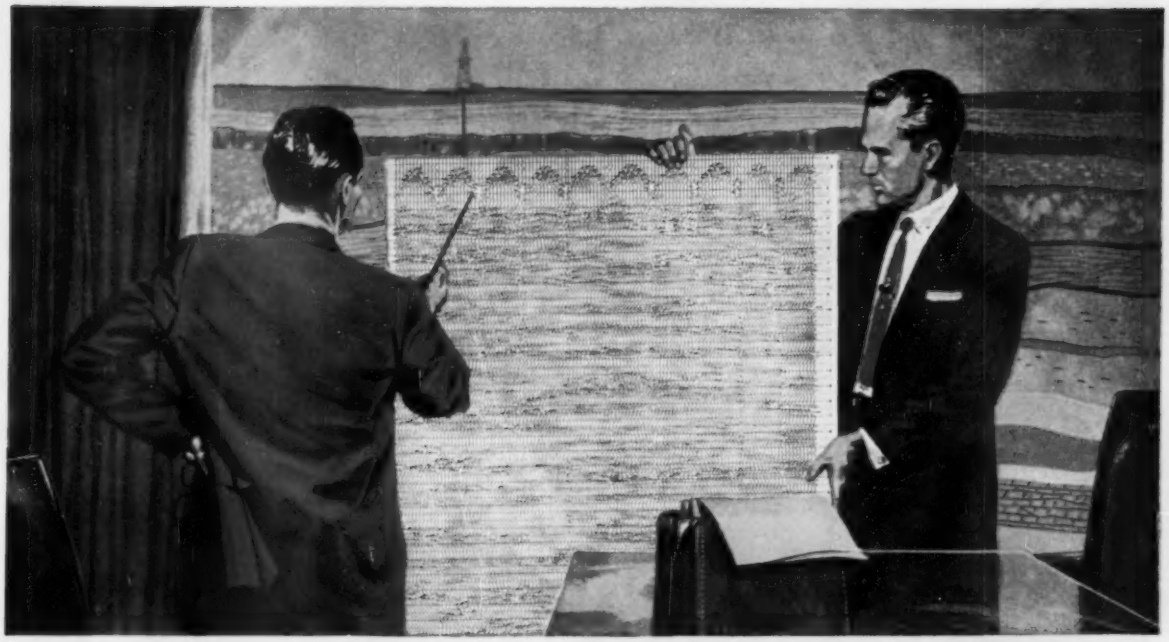
NKDBU Normal Diesel Power Unit—six cyl., 7-in. bore x 8¼-in. stroke, 1905 cu. in., 270 hp at 1200 rpm, (to 360 hp turbocharged).

OFFSHORE



VLRD Series Diesel Enginator—twelve cyl., 8½-in. x 8½-in., 5788 cu. in. engine direct connected to heavy duty AC Alternator—up to 800 KW.

Information.....



to complete the sub-surface picture

The SIE MS-12 **Geo**physical **Data** (GeoData) Processing System, makes the handling of magnetically recorded sub-surface information economically practical. **GeoData** equipment presents **all** of the geophysical information acquired with modern wide-band seismic techniques, in geologically oriented form at half the instrumentation cost of early laboratory systems!

Magnetic recordings are sequentially processed in the MS-12, and presented on a pen-written record, ready for interpretation. Up to 15 recordings can be processed in one hour by one operator . . . an important reduction in exploration cost. To get the **complete** sub-surface picture, make certain SIE **GeoData** equipment is part of your geophysical exploration program.

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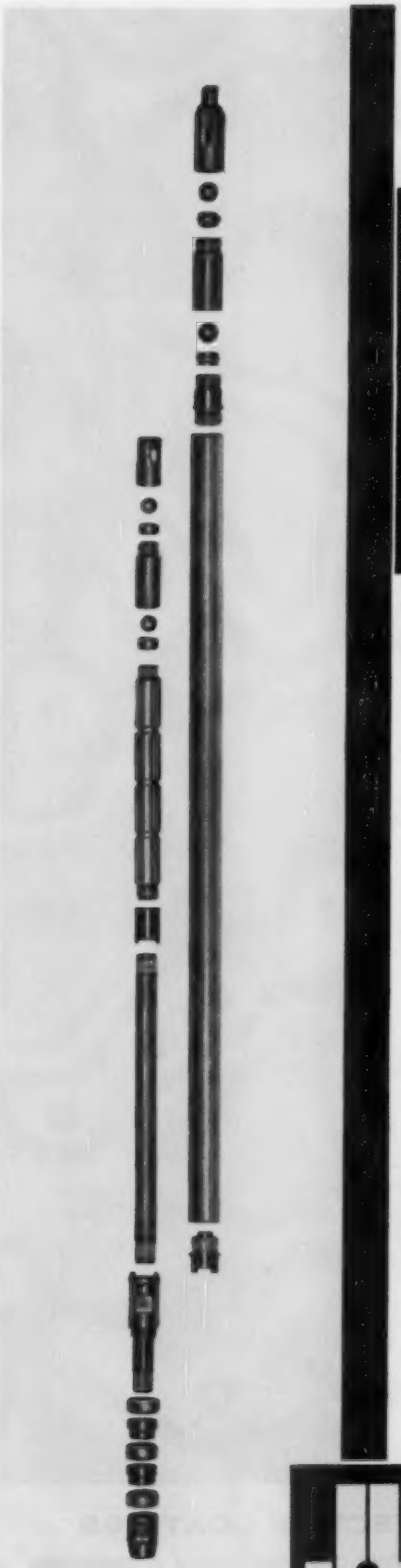

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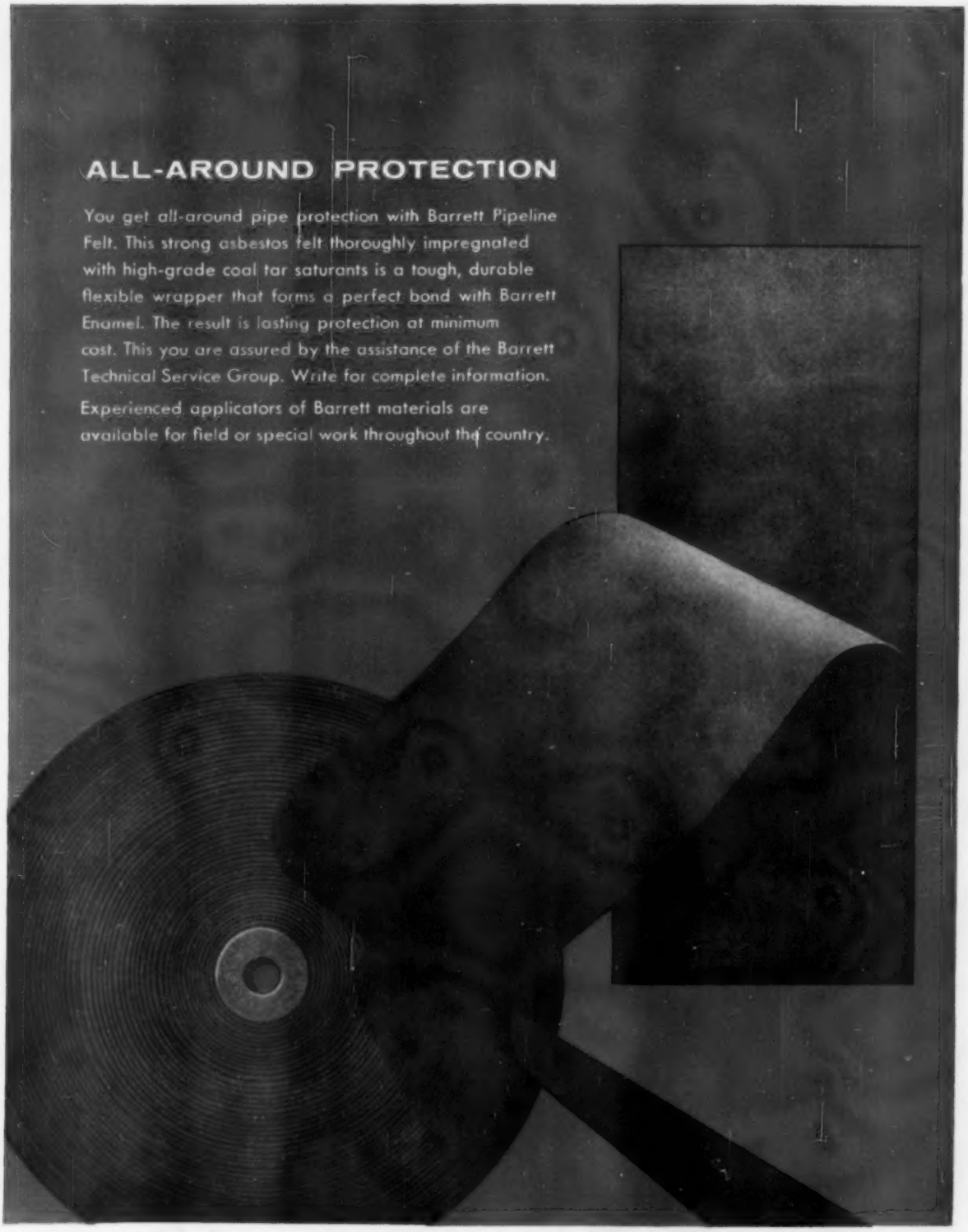
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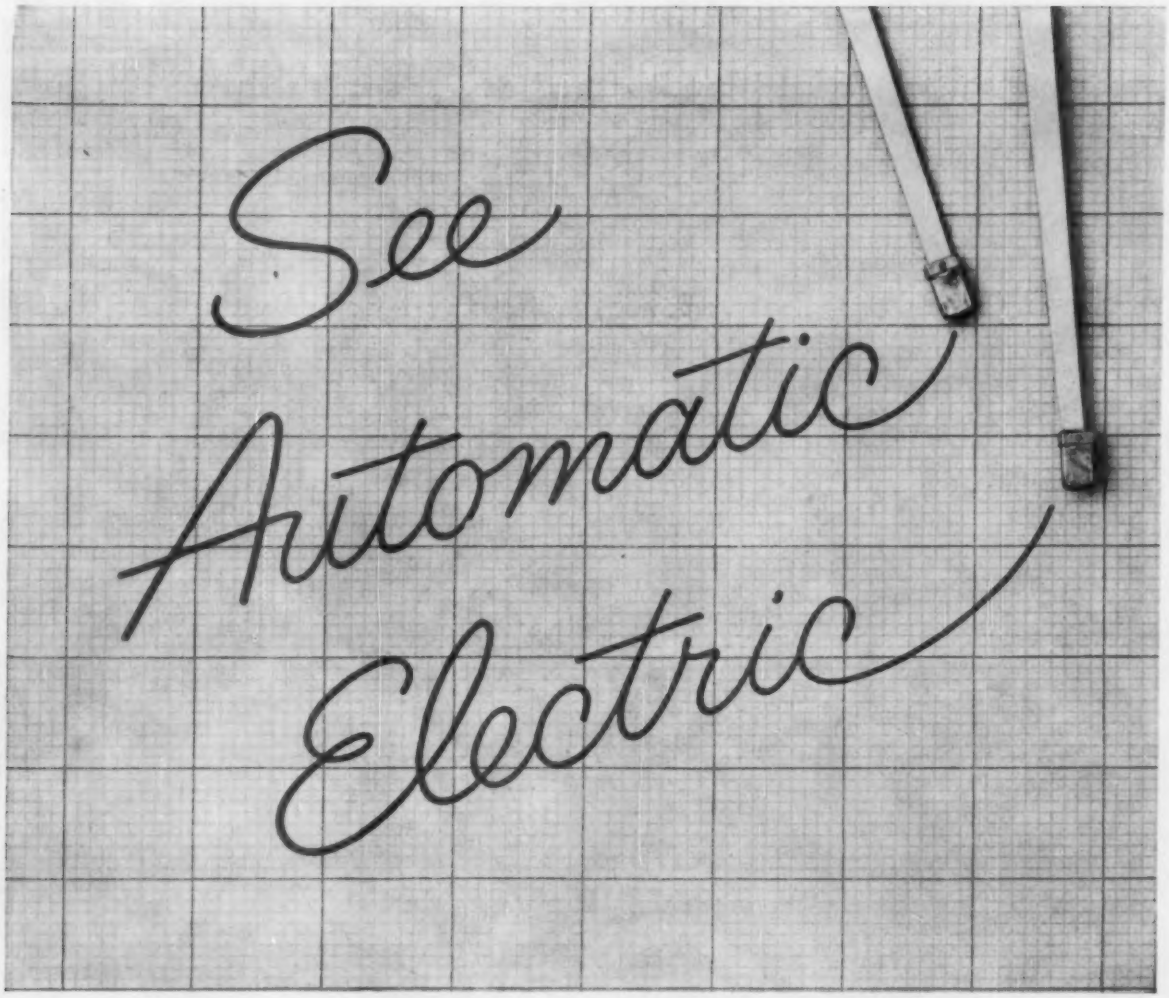

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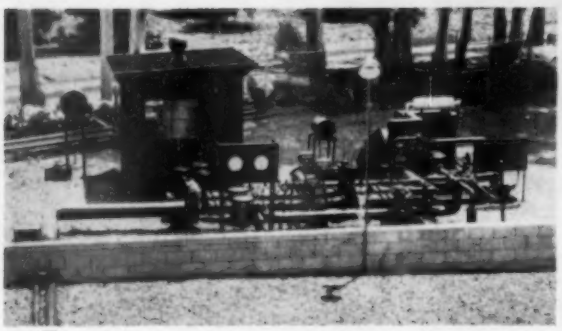

Hot water jacketing on Brodie Meters and throughout system maintains 150 F temperature in the blend of two crudes, one averaging 12° grav. and 20,000 S. S. U. visc., the other 15° and 3,800 S. S. U. at 100 F.

This compact Union Oil Company installation, with two Brodie *BiRotor* Meters, replaces conventional high tankage requirements for custody transfer.

L.A.C.T. proves practical handling heavy crudes with BRODIE *BiRotor* METERS

2,200 bbl. daily of low gravity, highly viscous crudes are transferred to Union Oil Company through their Yorba Linda, California, Automatic Custody Transfer System. Flow is accurately measured and recorded by two Brodie *BiRotor* Positive Displacement Meters with dual Brodimatic Printing Counters. Proving is on gravimetric basis.

In more and more producing areas, automatic custody transfer with the sustained accuracy of Brodie *BiRotor* Meters is gaining favor for elimination of human error in stick measurement methods, evaporation losses, clinging of crudes to tank walls, danger and inconvenience of climbing tank ladders in all kinds of weather, and the high cost of unnecessary tankage. Contact your Brodie Metering Specialist for the full story of *BiRotor* Meter advantages in L. A. C. T. service.

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tests prove ONLY BULLETS FRACTURE

TESTS WERE MADE IN HARD SANDSTONE BLOCKS. The tests were made through 5½" casing, cemented in holes drilled through the center of large Berea Sandstone blocks. The blocks had an average size of 52" on each side. Porosity and permeability averaged 12% and 150 md., respectively. Four-inch bullet and shaped charge perforators were used. After shooting, dye was forced into the block under 100 pounds pressure to determine the effectiveness of the perforations.

EIGHT BULLETS FIRED SIMULTANEOUSLY EXPLODED THE BLOCK! Five bullets fired,one at a time, into a second block produced numerous fracture patterns . . . some as much as ten inches back from the pipe. The target was pulverized in the vicinity of the bullet and dye coloration indicated interconnection between adjacent perforations.

EIGHT SHAPED CHARGES WERE FIRED INTO THIS BLOCK WITH NO EXTERNAL DAMAGE. After opening the block, excellent penetration . . . eight or more inches . . . was observed. There was no fracturing.

EXPERIMENTS IN CONFINED TARGETS SUBSTANTIATE THE EVIDENCE. Tests were also made in 14" Berea Sandstone cores encased in 4½" drill pipe. A single shot—bullet or shaped-charge—was fired through a steel plate into the core. Two out of three bullets produced fractures to the end of the core. None of the shaped charges developed fractures.

Motion pictures were taken of the tests which give graphic proof of the results. You may see the film upon request.

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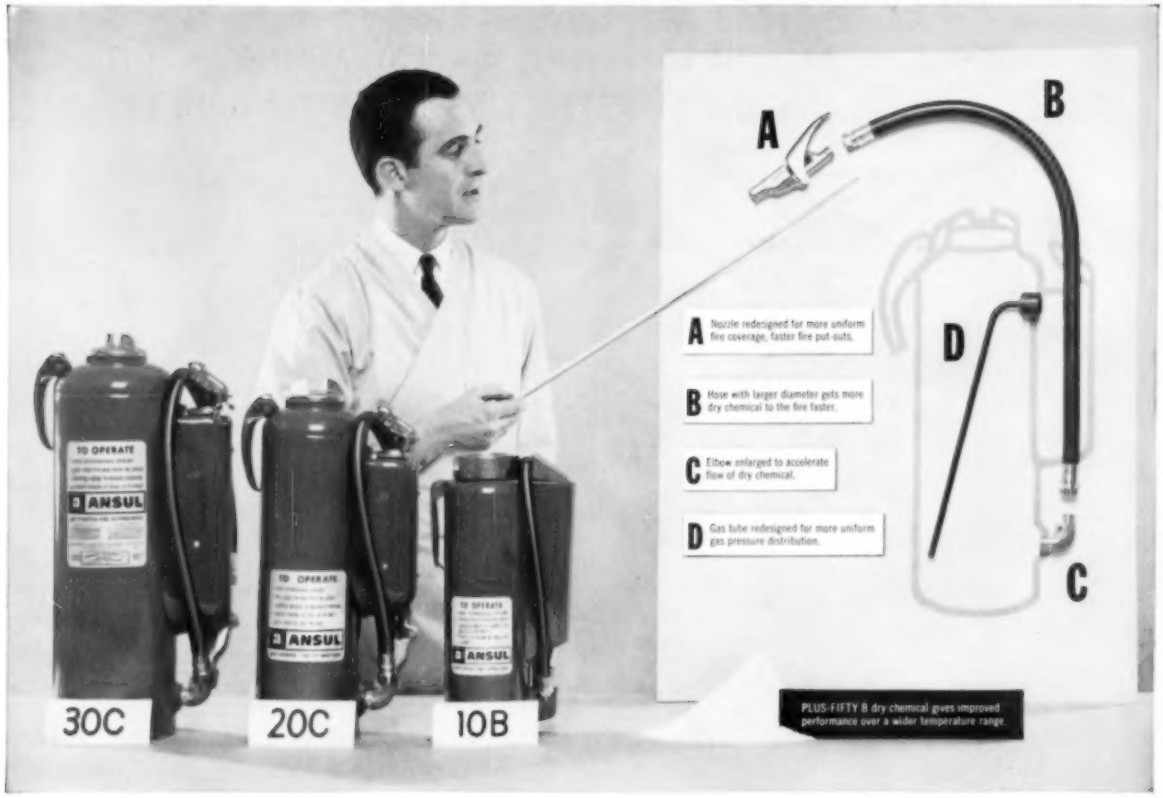
A
B
D
C
A Nozzle redesigned for more uniform fire coverage, faster fire put-outs.
B Hose with larger diameter gets more dry chemical to the fire faster.
C Elbow enlarged to accelerate flow of dry chemical.
D Gas tube redesigned for more uniform gas pressure distribution.
PLUS-FIFTY B dry chemical gives improved performance over a wider temperature range.
TO OPERATE
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30C
20C
10B

Important design improvements in these Ansul Extinguishers give you more fire fighting power at no increase in price. Three years of research and more than 2000 fire tests turned up some significant new information on dry chemical extinguishment. Ansul engineers were able to design these findings into three new extinguisher models, the 10B, 20C and 30C. Result, greatly increased fire fighting power. All Ansul equipment is backed by a five-year warranty. This is the best way we know to say Ansul fire extinguishers are the finest of their kind made anywhere.

ANSUL

The Ansul Chemical Co., Marinette, Wisconsin

By Merle Davis—Ralph Foster
Johnston Testers

FOR MORE INFORMATION ON YOUR DRILL STEM TEST

A check-off list for reverse circulating drill stem tests

The practice of reversing out the recovery of a drill stem test made in either an open or cased hole is now being widely used. The success of the practice has been proven with both high and low pressure tests and with both high and low liquid recoveries.

REVERSE CIRCULATION IN PERMIAN BASIN (OPEN HOLE TESTS)

The type A "sleeve" and the type B "knock-off" valves are preferred by the majority of the oil companies in West Texas. The type "B" sub has a slight edge because it can be run down in the drill collars closer to the test tool assembly.

The location of the reversing valves is dependent on the amount of "sample" to be left in the pipe and whether or not drill collars are run on top of the test tool assembly. The type "A" sub must be run above any small I. D. drill collars while the type "B" can be run "down" in the drill collars. It is common practice to separate the hydraulic valve and the shut-in valve (in the basic test tool assembly) by one or two singles—this provides a clean sample of the last fluid the formation produced into the drill pipe. The "sample" recovered above the shut-in tool and below the reversing sub may be slightly contaminated by the mud.

The high viscosity of the mud and the use of lost circulation material in some wells make it advisable to run both types of reversing subs each providing two reversing ports.

The reversing subs are opened *after* the mud pumps are started and mud is being pumped into the annulus. Normally, the difference in hydrostatic pressure (mud outside the drill pipe and oil, gas or water inside the pipe) will reverse almost all the fluid produced by the formation. In order to complete the reversing operation, the rams can be closed and *moderate* pressure applied to the hole. Extreme care must be used in pumping into the open hole to prevent breaking down a formation and causing lost circulation.

After reversing, the pipe can be pulled dry because the mud (which replaced the formation fluid) will drain back through the reversing sub ports.

Reverse circulation check off list

Before operating reversing valve
- ☐ Pump running
- ☐ Mud line valves positioned to divert mud flow to annulus
- ☐ Rams and/or Hydril checked for operation

Operating Reversing Valve (Type A and/or Type B)
- ☐ Close well in at surface
- ☐ Disconnect high pressure steel flow hose
- ☐ Close shut-in tool by rotating
- ☐ Reconnect high pressure steel flow hose
- ☐ Bleed down drill pipe (at go-devil hanger not used)
- ☐ Check mud in annulus (*must stay full* throughout reversing operation). Packer may be pulled loose if shut-in period is completed
- ☐ Drop proper go-devil to operate reversing sub
- ☐ Close surface valve (keep closed as long as annulus is *not* full)
- ☐ Control flow of recovery with surface valves so that hole remains full of mud.

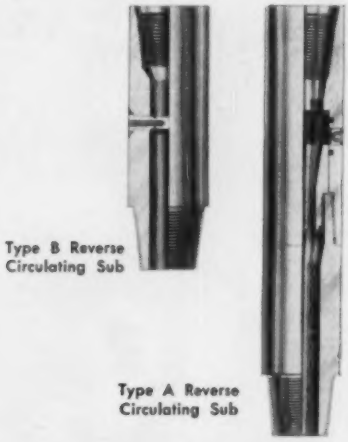
NOTE: If reversing stops, apply moderate pressure to annulus or apply moderate pressure to tubing or drill pipe until normal circulation is barely established then go back to reverse circulation.

When natural reversing is completed or to speed reversing procedure
- ☐ Close rams or Hydril
- ☐ Apply moderate pump pressure to annulus
- ☐ Stop pumps when clean mud of normal weight is reversed
- ☐ Remove flow head and come out of hole at proper speed (prevent swabbing). Pipe should pull dry.

A supplemental article on Reverse Circulation in the Gulf Coast area is now being prepared. Look for it in this publication. For complete information on Reverse Circulation write Johnston Testers, Houston, Texas.

Merle Davis
Dist. Mgr.
Crane, Texas

Ralph Foster
Dist. Mgr.
Snyder, Texas



Type B Reverse Circulating Sub

Type A Reverse Circulating Sub

JOHNSTON TESTERS

A Subsidiary of Schlumberger Well Surveying Corporation

first in drill stem testing

HOUSTON, TEXAS

LONG BEACH, CALIFORNIA • CALGARY, CANADA

FORMATION AND CASING TESTING — JOHNSTON

SEE HOW SOUTHERN NITROGEN USED ALCOA ALUMINUM TO BAN CORROSION

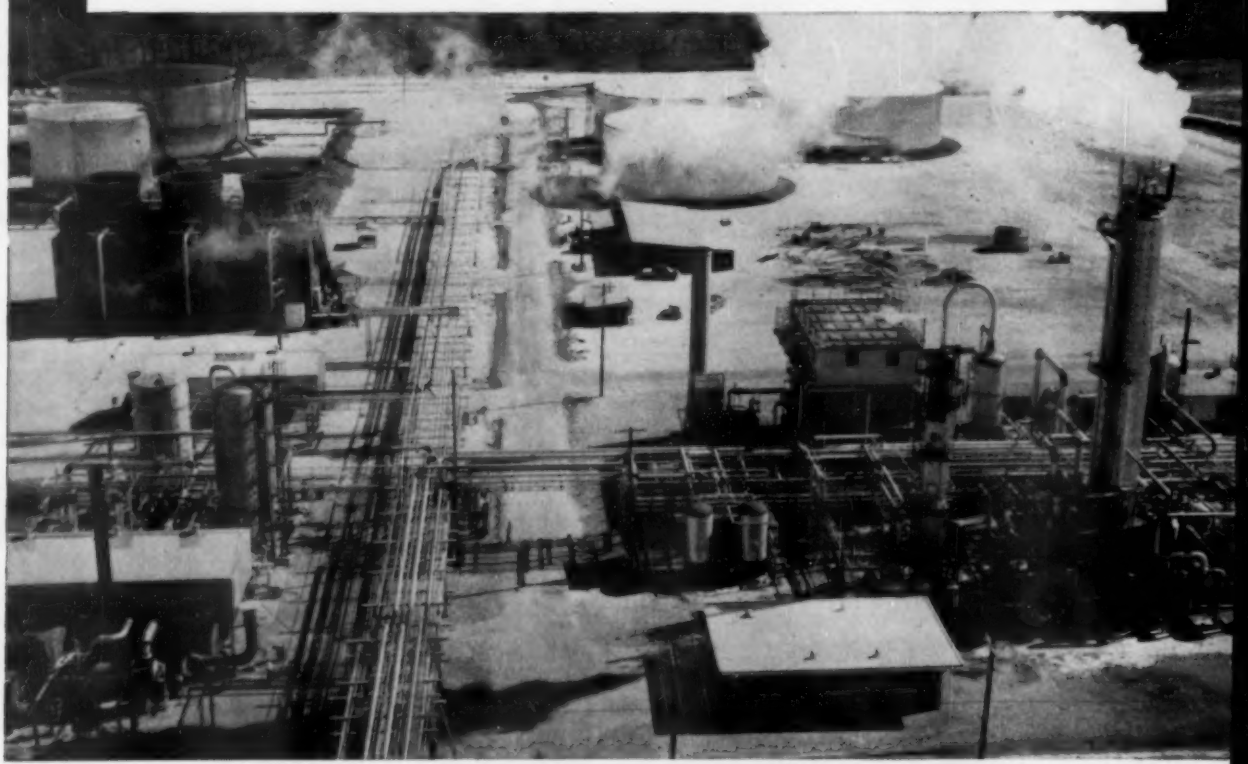
Southern Nitrogen Corporation, the South's newest nitrate fertilizer producer, recently completed a $14-million plant near Savannah, Georgia. Nearly everywhere you look in this modern processing operation you see ALCOA® Aluminum (over 500,000 lbs) at work to combat corrosion. The photographs on these pages show a few of the many ways it is used there.

It's easy to see why Southern Nitrogen used so much ALCOA Aluminum. No other metal provides so many valuable benefits for such a wide variety of uses. And ALCOA, alone, can offer unparalleled technical assistance based on over 30 years' experience applying *all these aluminum advantages in the process industries:*

- *Excellent corrosion resistance* extends service life and reduces maintenance to a minimum.
- *Light weight—high strength* make handling easy and economical . . . often permit substantial construction economies.
- *High thermal conductivity* combined with corrosion resistance often makes aluminum the lowest cost material suitable for many demanding heat transfer operations.
- *Nonsparking!* • *Nonmagnetic!* • *High reflectivity!*
- *Excellent electrical conductivity!*

The plant designers, The Girdler Company, made full use of all the advantages of working with ALCOA. They were able to employ the unequaled aluminum experience of ALCOA engineers . . . to help them choose the right aluminum alloys and fabrication methods for dependable, corrosion-free service in every part of the plant.

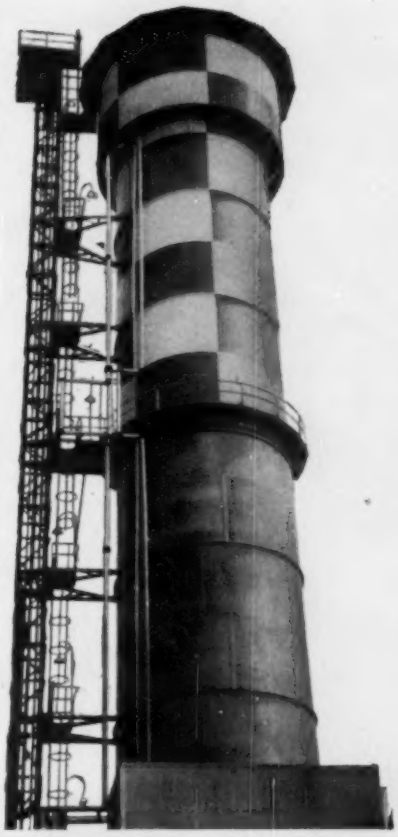
When *you* have a metal problem, call on ALCOA to find a sound, economical aluminum answer. Consult the nearby ALCOA sales office listed in the Yellow Pages of your telephone directory. Or outline your metal needs in a letter to ALUMINUM COMPANY OF AMERICA, 904-L Alcoa Building, Pittsburgh 19, Pa.



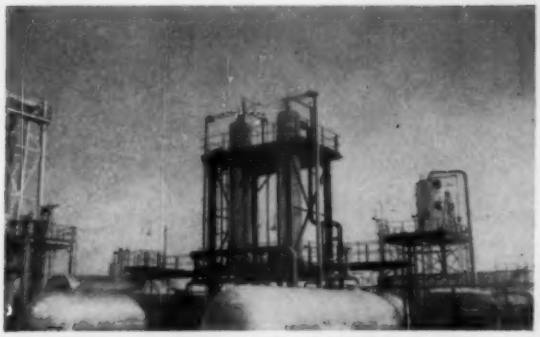
The Girdler Company designed this huge new nitrate fertilizer plant for Southern Nitrogen Corporation. The plant is designed for annual production of 120,450 tons of ammonium nitrate fertilizer, 91,250 tons of nitric acid, 10,950 tons of urea and 328,500 tons of fertilizer solutions.

Plant employs thousands of feet of Alcoa Aluminum piping and conduit and is liberally painted with highly reflective aluminum coatings.

These 1,650,000 gallon storage tanks of Alcoa Aluminum alloy 5052 successfully fight the corrosive action of 85% ammonium nitrate. The tanks, 94 ft in diameter by 32 ft high, were built by Chicago Bridge & Iron Co.

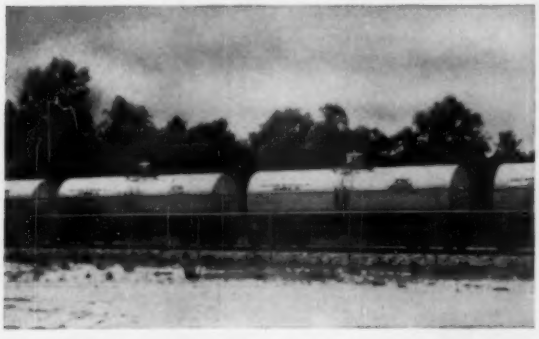


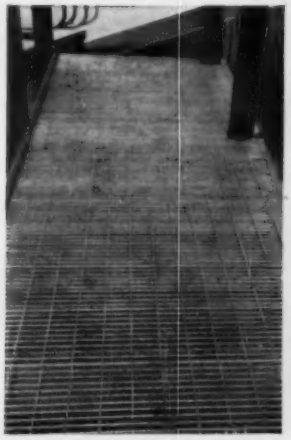
Corrosion-resistant Alcoa Aluminum (alloy 6061-T6) was used throughout this prilling tower . . . to prolong service life without frequent, costly maintenance shutdowns. Built by The Steel Products Co., Inc., Savannah.



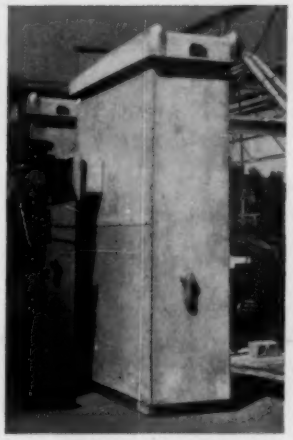
Alcoa Aluminum in these ammonia absorber coolers prevents corrosion while providing constantly high heat transfer efficiency. Coolers built by Henry Vogt Machine Co.

The superior corrosion resistance of Alcoa Aluminum in tank cars prolongs service life and prevents product contamination. Tanks built by Graver Tank & Mfg. Co., Inc. for Union Tank Car Co.





Lightweight gratings of Alcoa Aluminum are used in traffic areas throughout the Southern Nitrogen plant. They stand up under heavy traffic and easily withstand the attack of corrosive industrial atmospheres.



Alcoa Aluminum in electrical bus bar, conduit, fixtures and enclosures gives Southern Nitrogen effective protection from electrical breakdowns during prolonged exposure to corrosive industrial atmospheres.

NEW!
"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

There's a Continental-Emsco Slush Pump rated for your rig..

From portable rigs to deep offshore installations, there's a Continental-Emsco Slush Pump that will give you the volume-and-pressure range to meet your drilling requirements. A wide selection of liner sizes allows you to step-up pressures or volumes *gradually*.. or *fast*, as drilling conditions dictate.

You'll find these pumps are big in performance, low-cost in operation, and that they give you *more horsepower per pound* than any other slush pump.

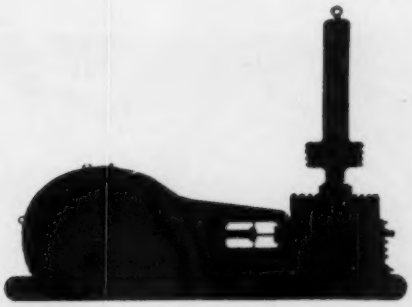
A strong, rigid, lightweight power end is the result of Continental-Emsco's *Fabriform Construction*, which uses steel plates and special shapes in place of a bulky, heavy, rough casting. This means lower transportation costs and easier field handling.

Lubrication is automatic, since all running parts are flood lubricated by a positive-splash system.. troublesome lubrication and grease fittings are eliminated.

Typical of the simplified maintenance features of these pumps is their patented "exposed" liner construction. Here packing leaks can be spotted immediately.. long before damage can be.. or has been.. done.

..for Shallow Drilling
D-175 and D-300

In the 175 and 300 horsepower range, these small pumps can produce the pressures and volumes to match the drilling range of all types of portable rigs . . and save on weight.

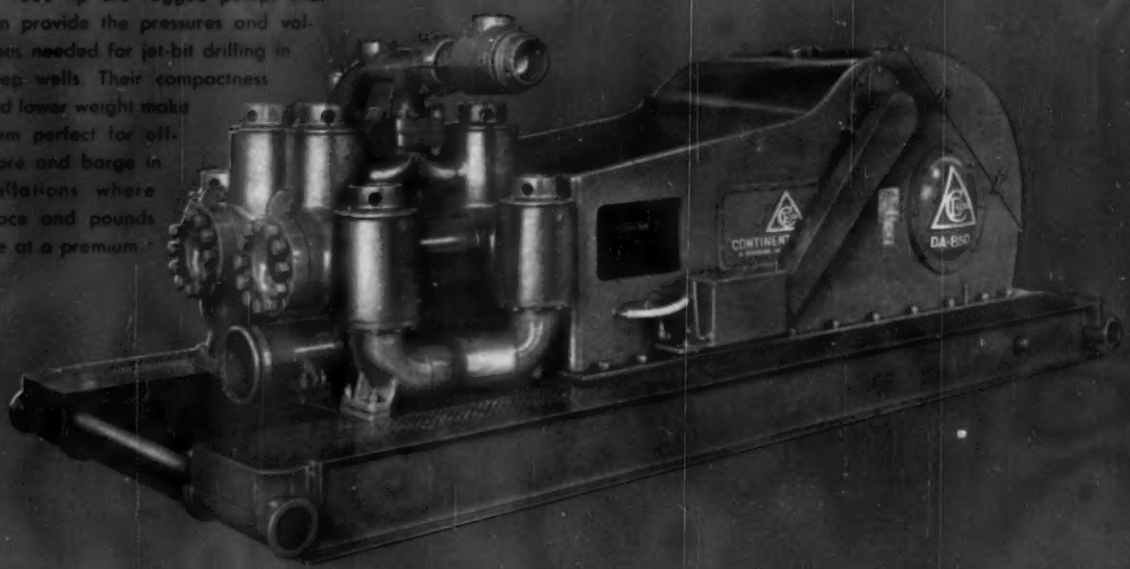


..for Medium-Deep Drilling
DA-500 and D-700

These pumps are designed for rigs in the 600 to 1100 horsepower class. Here are pumps sized for medium-deep drilling. They are big in capacity . . lower in weight . . yet small enough to require a minimum amount of power.

..for Deep Drilling
DA-850 and D-1000

The DA-850 at 850 hp and the D-1000 at 1000 hp are rugged pumps that can provide the pressures and volumes needed for jet-bit drilling in deep wells. Their compactness and lower weight make them perfect for offshore and barge installations where space and pounds are at a premium.



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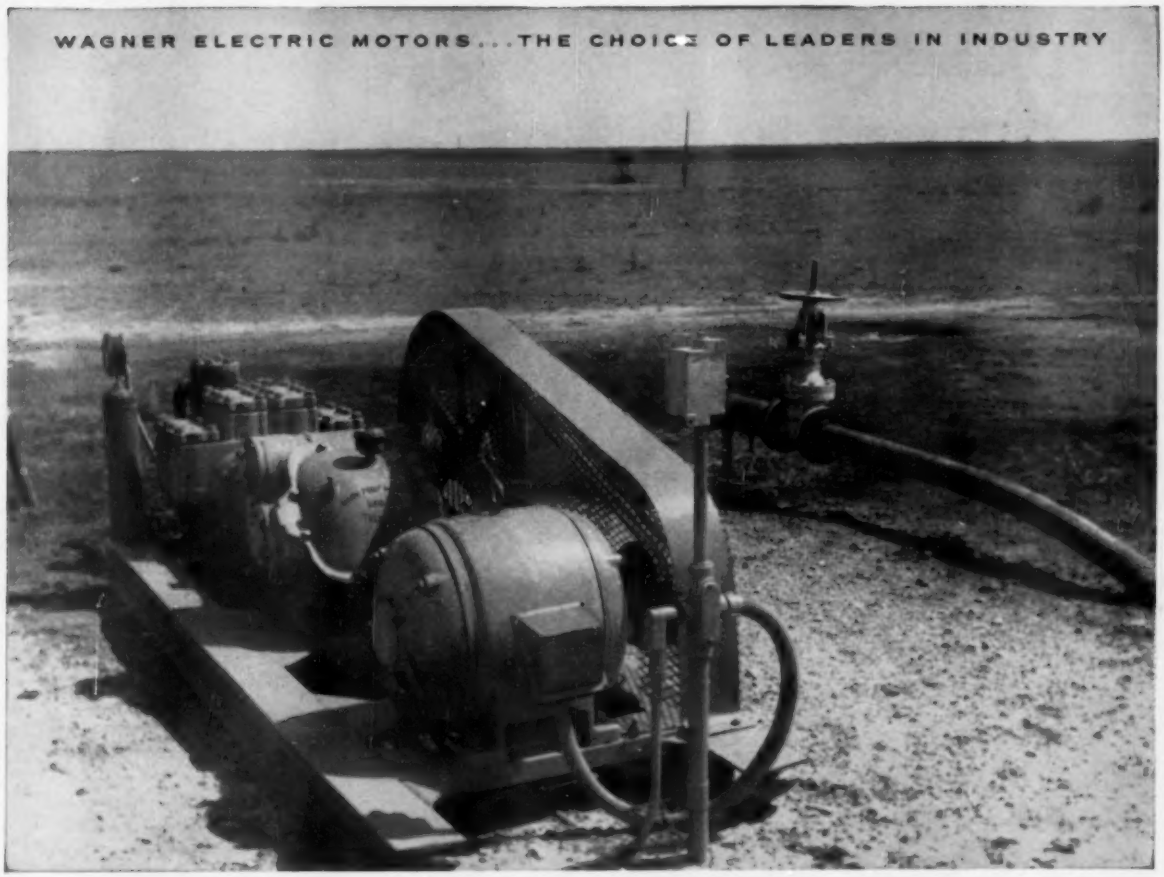
WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



for uninterrupted gathering... power your pumps with Wagner Motors

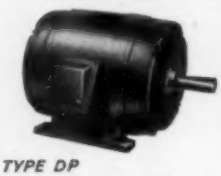
A motor that drives a pipe line gathering pump has a downright lonesome job. Nothing for company but an occasional horned toad or rattlesnake. Even the visits of the maintenance crew are few and far between—especially if it's a Wagner Motor.

Wagner Type DP cast-iron frame oil well pumping motors are especially designed for year around, maintenance-free, rugged outdoor service. They are protected against rain, sand, snow, by an enclosure that is completely drip-proof—virtually splash-proof. They are protected against horned toads and rattlesnakes by screened ventilating openings. They are protected against acids, alkalies and corrosive elements by their cast iron frames and endplates. Conduit boxes are moisture-proof and dust tight.

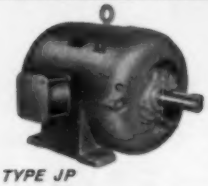
For locations where only single-phase current is available, Wagner has high power factor type capacitor-start motors with the same protection. You can get Wagner oil well pumping motors *from stock* in your immediate area.

Wagner also supplies the petroleum industry with Type JP explosion-proof motors in ratings through 250 hp. Bulletins MU-132 and MU-137 give full information. Write for your file copies.

TIME-TESTED FAVORITES OF THE PETROLEUM INDUSTRY



TYPE DP



TYPE JP

In the field... *In the refinery!*

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

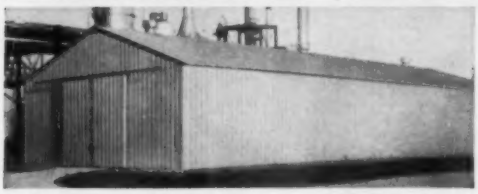
M57-15

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

Famous fire-fighter gets luxury offices, workshop at moderate cost with BUTLER buildings



Plain or Fancy — Butler buildings are used throughout the oil industry for offices, warehouses, compressor houses, tool and machinery sheds, garages.

This attractive Butler building is the base of operations for one of the world's best known oil well fire-fighters . . . Myron M. Kinley. He's the man who has fought and conquered raging infernos in almost every oil field in the world.

Such a distinctive business deserves a distinctive home – and Mr. Kinley got it at a moderate cost by combining an architecturally designed front and a Butler metal building. "We used a Butler pre-engineered steel framework and covered the sides and roof with Butler metal panels," explained Mr. Kinley. "This saved plenty because erection was so fast and simple."

"We like our Butler building fine," said Mr. Kinley. "It does a good job of housing our offices and workshop for making special oil field tools. Both areas are completely air conditioned. And, of course," he added with a grin, "because it's mostly Butler metal construction, it's fire-safe."

Butler buildings can help you save money, too. See your nearby Butler Builder for details. He's listed under "Buildings" or "Steel Buildings" in the Yellow Pages. Or write us.

BUTLER STEEL PRODUCTS

BUTLER MANUFACTURING COMPANY

7464 East 13th Street, Kansas City 26, Missouri

Manufacturers of Buildings • Oil Equipment • Farm Equipment • Dry Cleaners Equipment • Outdoor Advertising Equipment • Custom Fabrication

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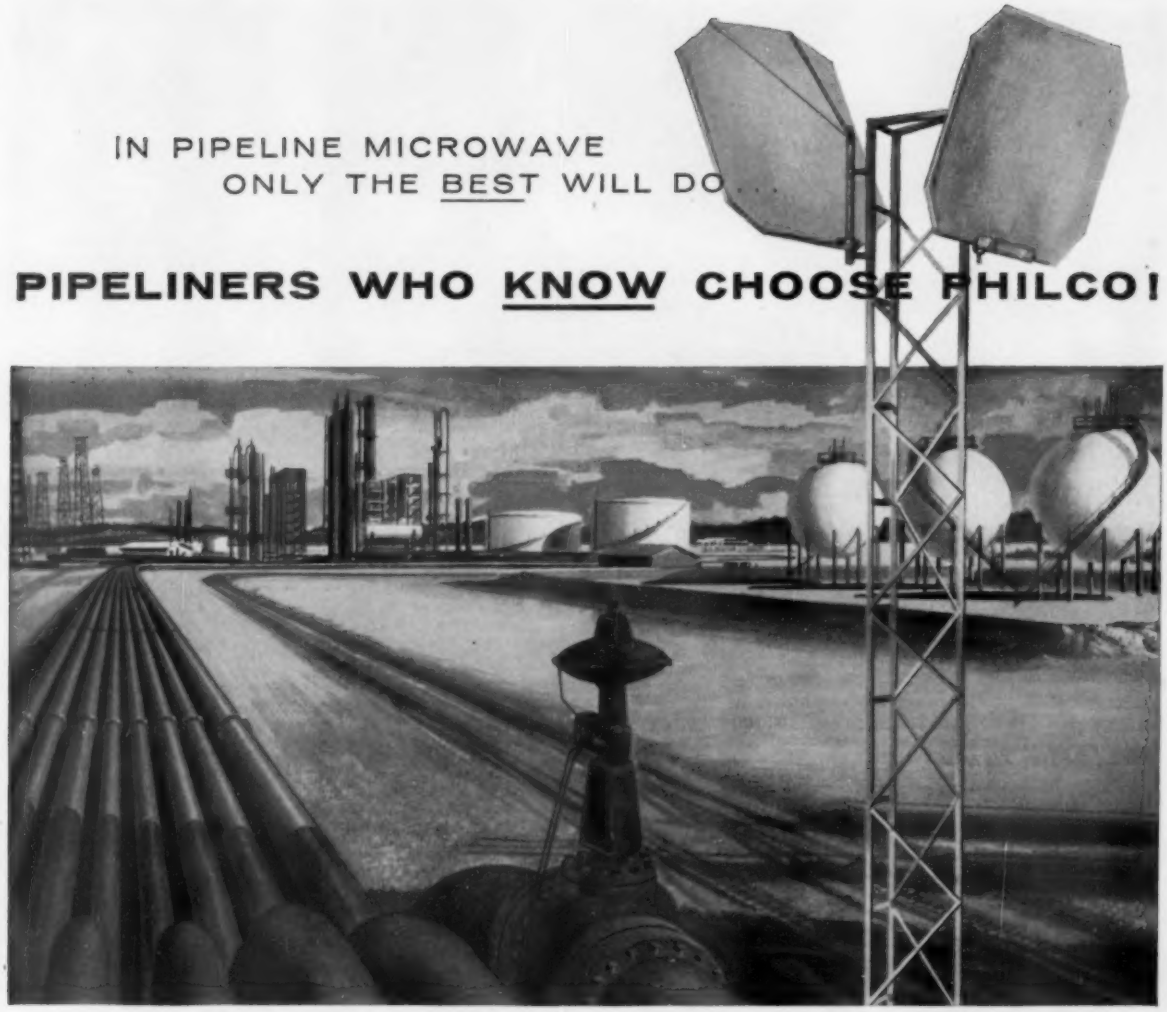
IN PIPELINE MICROWAVE
ONLY THE BEST WILL DO . . .

PIPELINERS WHO KNOW CHOOSE PHILCO!



Philco Microwave Delivers Outstanding System Reliability, Economy of Installation and Operation, Simplified Equipment Maintenance!

Philco microwave is proving itself in a growing number of pipeline applications. With 240 channel baseband capacity for telephone, telemetering and remote control—including reserve capacity for high-speed computer data transmission—Philco microwave fills both immediate and long-range requirements of modern pipeliners.

Semiconductor rectifiers replace conventional tubes in the new Philco heavy duty tubeless power supplies, assuring minimum maintenance and significant reductions in operating costs. Printed wiring panels increase circuit stability, simplify field maintenance. Klystrons are cooled by convection—compact heat sinks eliminate the need for bulky blowers.

Here is reliability of performance unaffected by severe weather, free from the many limitations of wire and pole line construction, unhampered by problems of difficult terrain, over-water transmission or expensive rights-of-way.

Philco engineers will be happy to help with your special microwave requirements. Please contact us for further information. Look ahead . . . and you'll choose PHILCO.

PHILCO®

Government & Industrial Division
Philadelphia 44, Pennsylvania
In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

NOW..3 new International V-8's

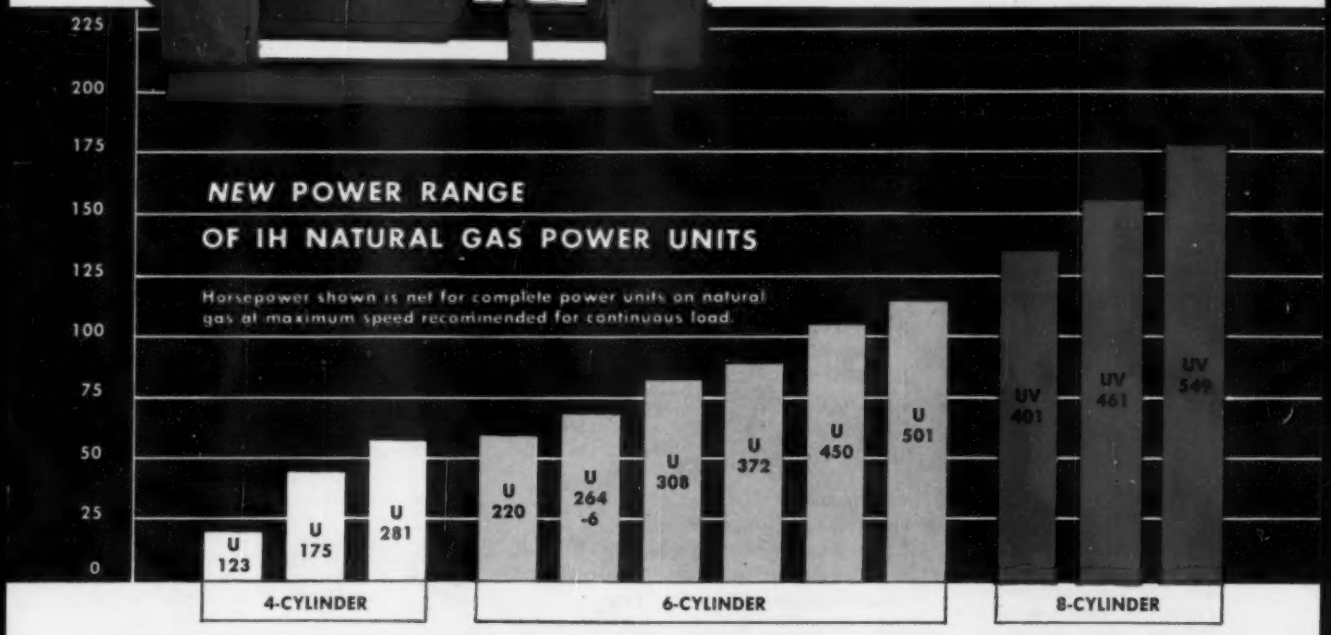
Now you have an even wider selection of economical International valve-in-head gas power for your oil field needs – three new power-packed, compact V-8's – the UV-549, UV-461, and the UV-401.

NEW V-8 UV-549 POWER UNIT. 178 net hp @ 2,600 rpm on natural gas, 200 hp on LPG, and 208 hp on gasoline. Stripped engine develops 257 hp on gasoline at 3,400 rpm.

These new V-8's increase the International carbureted line to 12 models that can be operated on the fuel of your choice—natural gas, LP gas, or gasoline. The bar chart below shows the power range of these 12 units when operating complete with radiator and fan on natural gas. Model numbers indicate piston displacement.

Standout features of the compact new V-8's that help you cut operating costs include: rigid, Y-shaped block; short-stroke, heavy-duty, cam-ground aluminum pistons; big, smooth-running, counterbalanced, tocco-hardened, 5-bearing crankshaft; large-area, long-life, tri-metal, replaceable bearings; combination full-flow, by-pass oil filter for long-life pressure lubrication; full-power, down-draft carburetion; oil cooler; and a 12-volt electrical system.

For the best in dependable power for your pumping, exploratory drilling and servicing rigs, it will pay you to investigate this new International line. You'll get power that outperforms with more in-built values. You'll get power that's backed by fast, efficient parts and service support available to customers throughout the world.



INTERNATIONAL® CONSTRUCTION EQUIPMENT

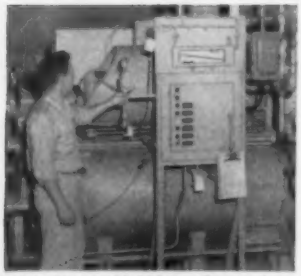
International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Power Units . . . Motor Trucks . . . Farm Tractors and Equipment.

Interior of Kemp Generator in action

Burned up by inert gas costs?

Come to Kemp



This Kemp 30,000 cu. ft. per hr. Inert Gas Generator meets all purging and blanketing needs at Gulf Oil's Port Arthur plant. Complete safety is assured with the more-than-adequate supply provided by the generator. Refineries everywhere depend on Kemp equipment.

Kemp Inert Gas Generators end the trouble and expense of bottled gas, provide a highly flexible source of supply at a fraction of the cost. With Kemp generators in your operation, you can make liberal use of inerts . . . apply them to the improvement of many other operations. There are Kemp units to manufacture inerts in any quantity, for any application.

Kemp equipment is dependable. You get rugged design, simplicity of operation, and almost complete elimination of maintenance. Each unit is completely protected with safety devices. The heart of the generator is the famous Kemp Carburetor, for precise control of inert quality, regardless of system demands.

Kemp produced inerts belong in your plant . . . for blanketing, purging, and protective uses . . . agitation of batches during cooking . . . conveying combustibles and controlling reactions.

For new installations or modernization programs, call in your Kemp Representative. Or write us for Bulletin I-10. The C. M. Kemp Mfg. Co., 405 E. Oliver St., Baltimore 2, Md.

Kemp Convection Dryers

Kemp Immersion Melting Pots

KEMP
OF BALTIMORE

Kemp Industrial Carburetors

Kemp Oriad Dryers

Magnolia Co. Installing Oil Industry's First Offshore Microwave Radio Communications

To coordinate production and pipe line operations in the Gulf of Mexico off Morgan City, La., a five-station, four-hop RCA Microwave Radio System, now under construction by Magnolia Petroleum Co., Dallas, will span a distance of more than 75 miles and provide approximately 55 miles of over-water communications.

Dependable RCA Microwave Radio was selected as the communications medium because of crowded VHF radio conditions in the area; also to provide facilities for additional services, such as telemetering and equipment control.

The system will be extended from Morgan City to Burns Terminal, 19 miles away, then 24 miles out into the Gulf of Mexico to Magnolia's Block 51 oil field. From Block 51 the system will extend 23 miles to Block 126 and on to Block 128, nine miles away. RCA CW-20 equipment, operating in the 2000 mc band will be used, with a capacity of 30 channels.

RCA Microwave Specialists will be glad to answer any questions and help plan your installation. Mail coupon for further particulars on use of RCA Microwave Radio in utilities, pipe lines, turnpikes and other applications.

RCA MICROWAVE RADIO . . . performance proved in more than a million channel miles of operating systems throughout the world.

Radio Corporation of America
Communications Products
Dept. Z-89, Building 15-1, Camden, N. J.

Please send me latest literature on
☐ RCA Microwave Radio for use in _____

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ Have representative contact me.

RADIO CORPORATION of AMERICA
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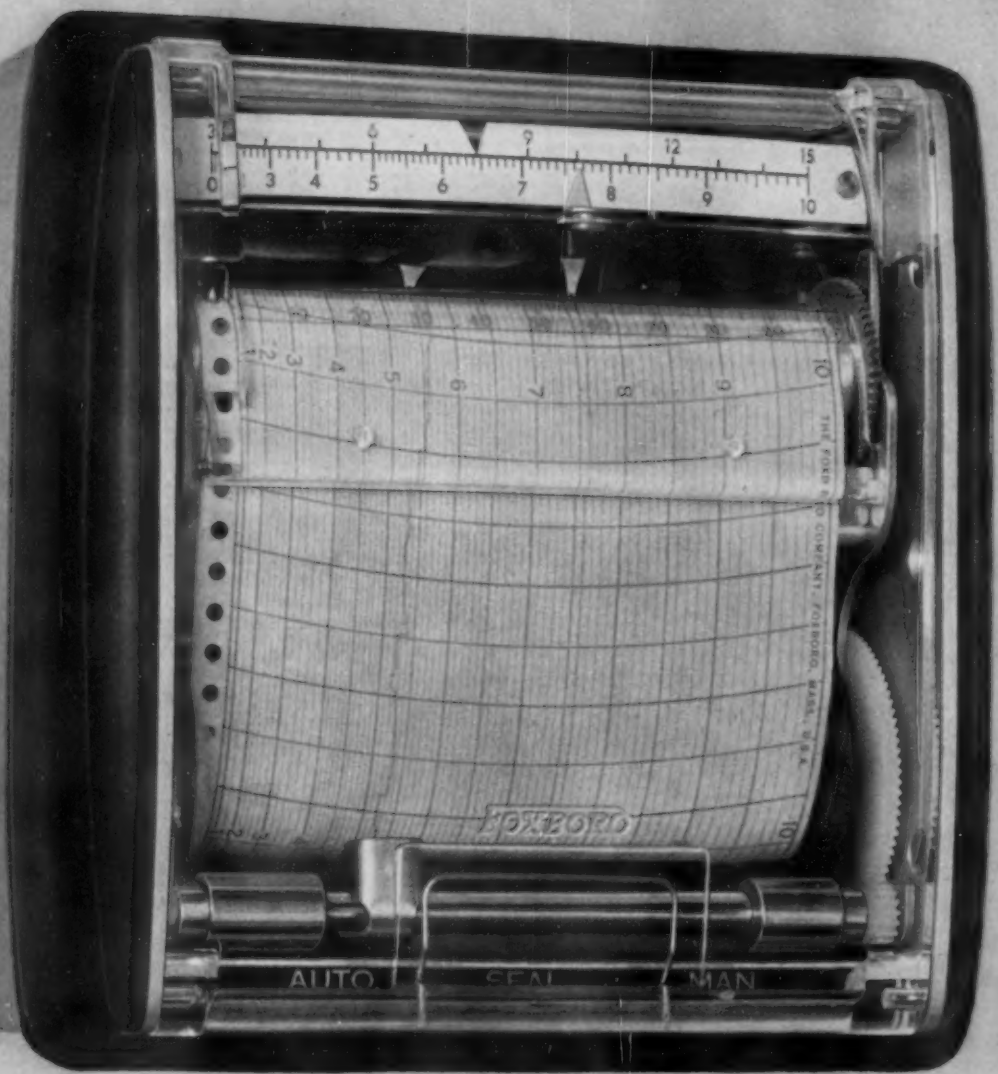
CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal

FOXBORO
adds new convenience features to CONSOTROL* Recording Control Stations



Shown actual size

*Reg. U. S. Pat. Off.

– further "operating ease" combined with accuracy – readability – top performance

3-pen recording, angle mounting, indicating tear-off bar . . . just a few of the new convenience features you'll find in Foxboro Consotrol Recorders and Recording Control Stations.

But these new operating benefits are only part of the story. Additional control functions are handled easily with Consotrol Instruments. Auto-Selector control — the control of related variables through a common valve is now possible with Consotrol small-case panel instrumentation, as is centralized control of batch processes.

With their new, exclusive operating conveniences and process control functions, Foxboro Consotrol Recording Control Stations, now, more than ever, provide you with superior centralized recording and control. You'll find they maintain the highest standards of precision and dependability — are the simplest to maintain.

Write Foxboro for full details. Ask for Bulletin 13-18A. **The Foxboro Company, 6011 Norfolk St., Foxboro, Mass., U.S.A.**

FOXBORO

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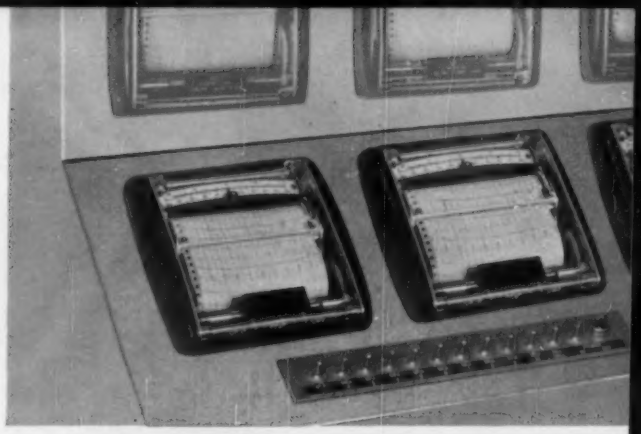
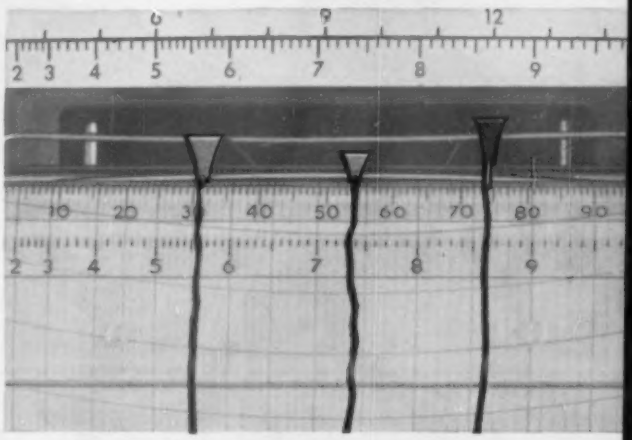
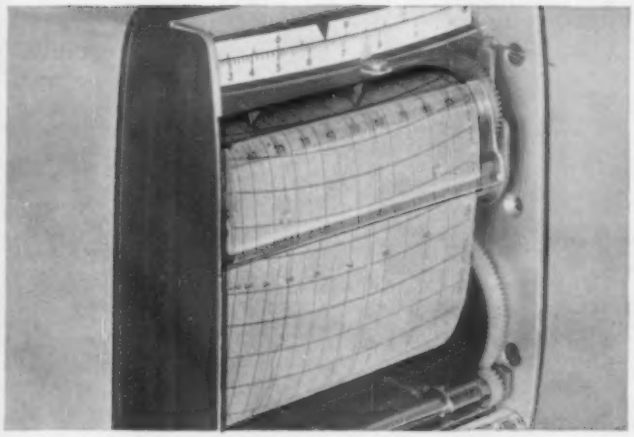


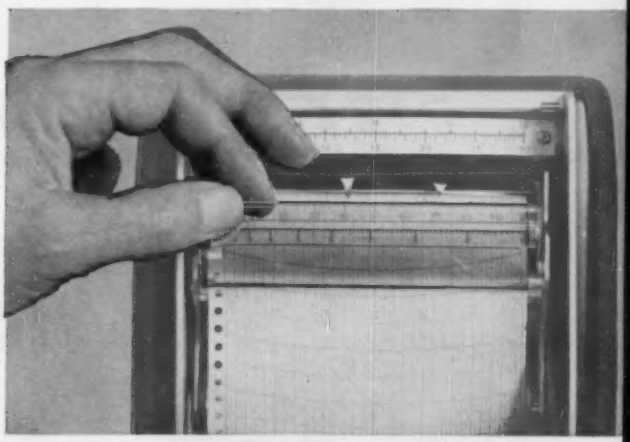
New – angle mounting Now you can panel-mount your Consotrol Recording Control Stations as much as 75° from the vertical, giving you more usable panel space closer to the floor. Operator can read lower instruments without stooping.



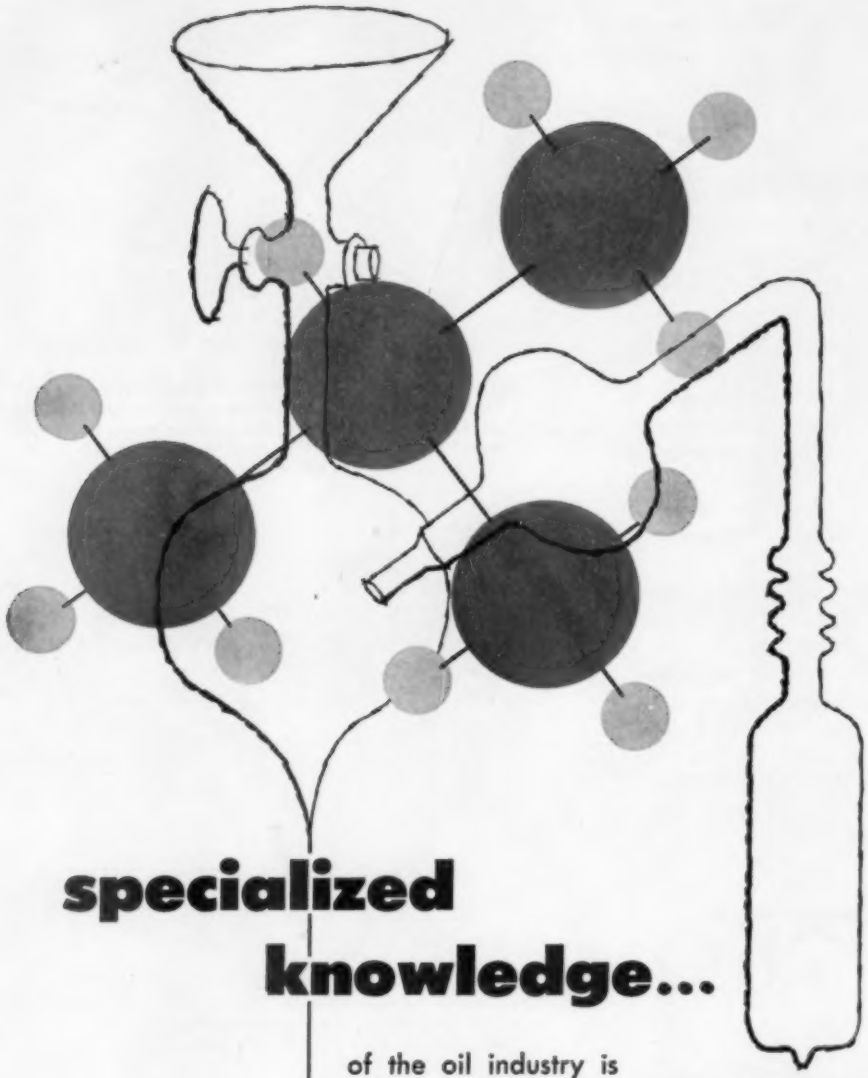
New – 3-pen recording 3 continuous records are simultaneously recorded on one chart, with this new Foxboro 3-pen recorder. Related measurements can be grouped for quick, easy comparison . . . valuable panel space is saved.



Full scale chart The Foxboro 4-inch Consotrol chart, with the same length scale as a 12-inch circular chart, travels vertically from the top. No sagging . . . no misalignment. Pen travels in same direction as circular-case recording pen.



New – indicating tear-off bar
Ideal for multi-pen control stations and recorders, this new "see-through" plastic tear-off bar has indicating scales to read second and third variables. Scale colors match pen colors – makes following a process a cinch for the operator.



specialized knowledge...

of the oil industry is
important to sound financing of oil operations.
That's why you hear more and more oil men say:

"for my money... it's THE FORT WORTH NATIONAL BANK"

FWNB

CAPITAL AND
RESERVE ACCOUNTS
OVER $20 MILLION

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

HELPING BUILD A GREATER FORT WORTH AND SOUTHWEST

Newly designed
Type H Motor Control

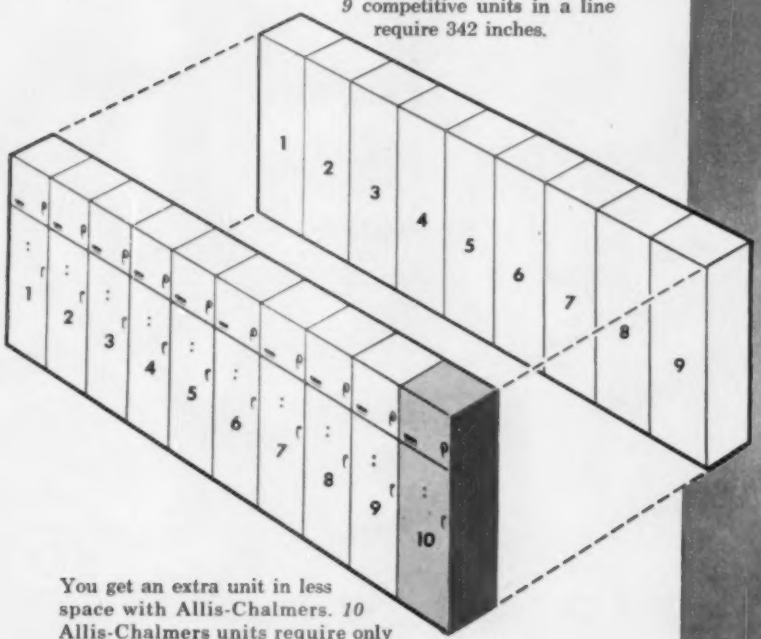
Saves valuable plant space

Newly designed Allis-Chalmers high voltage control units are only 34 inches wide. This means you can put 10 Allis-Chalmers cabinets in less space than required by 9 competitive 38-inch units. In addition, the narrower width means less space required for door swing. Result: You save a total of 2.36 sq ft of floor space per unit. On 10 units, this means a saving of 23.6 sq ft.

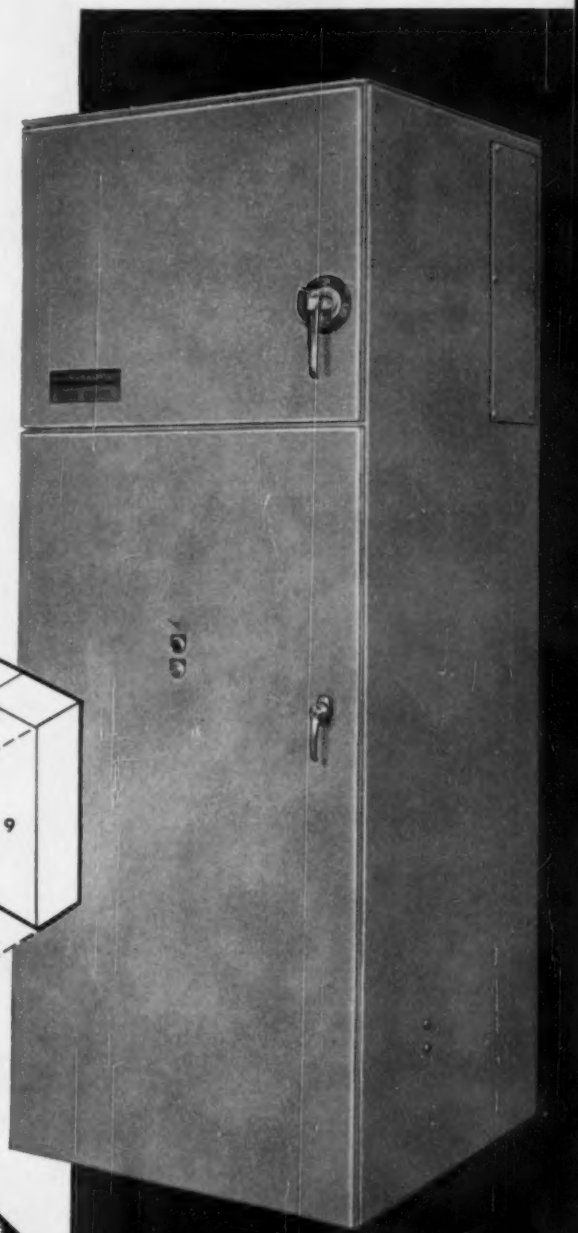
Smaller size is only one of many advantages in this new Allis-Chalmers design. You also get full-front access, more room for optional features, a completely tested unit, and the ultimate in protection for men and machines.

For more information on how this new control design can help you, call your nearest Allis-Chalmers representative, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

9 competitive units in a line require 342 inches.

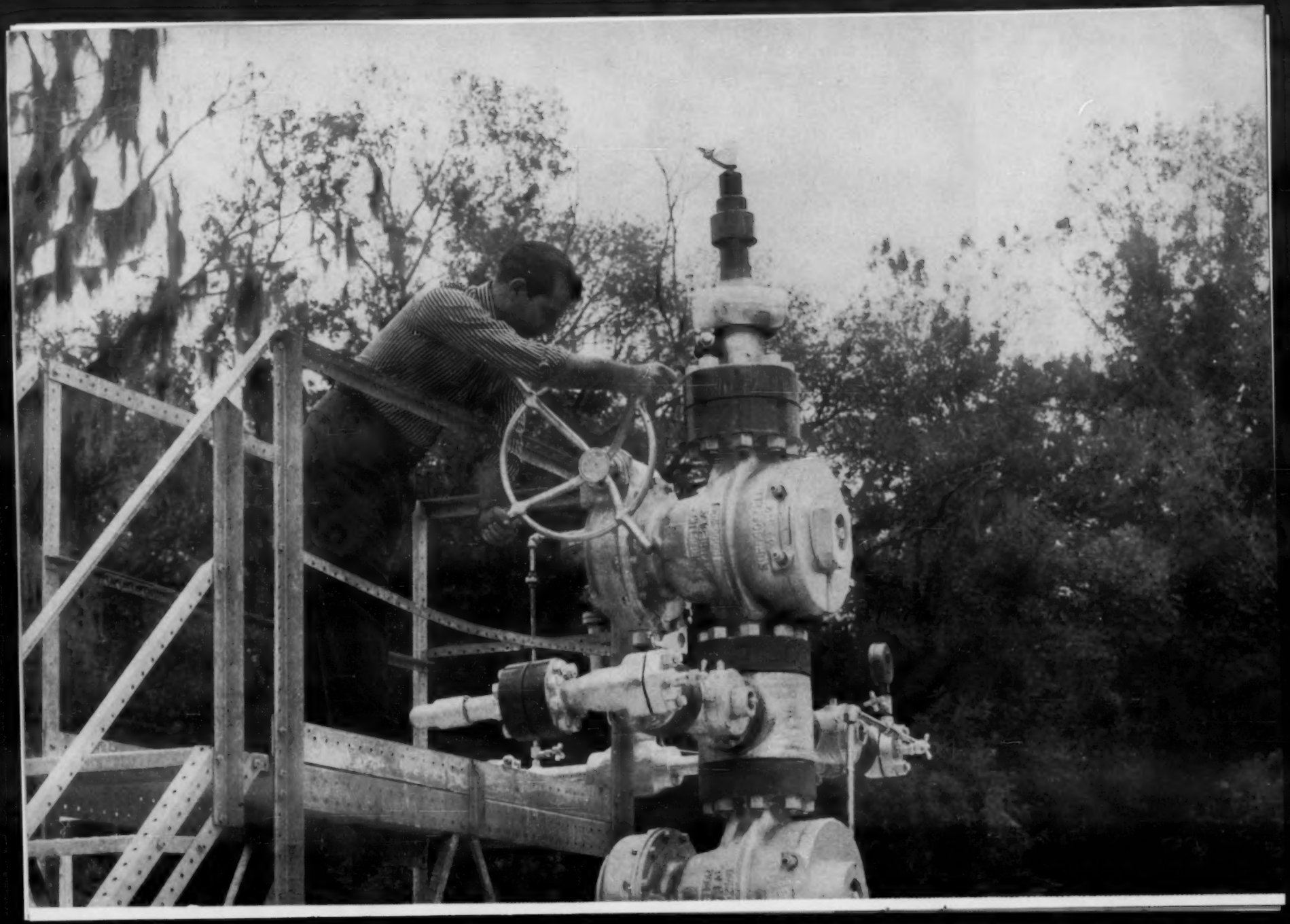


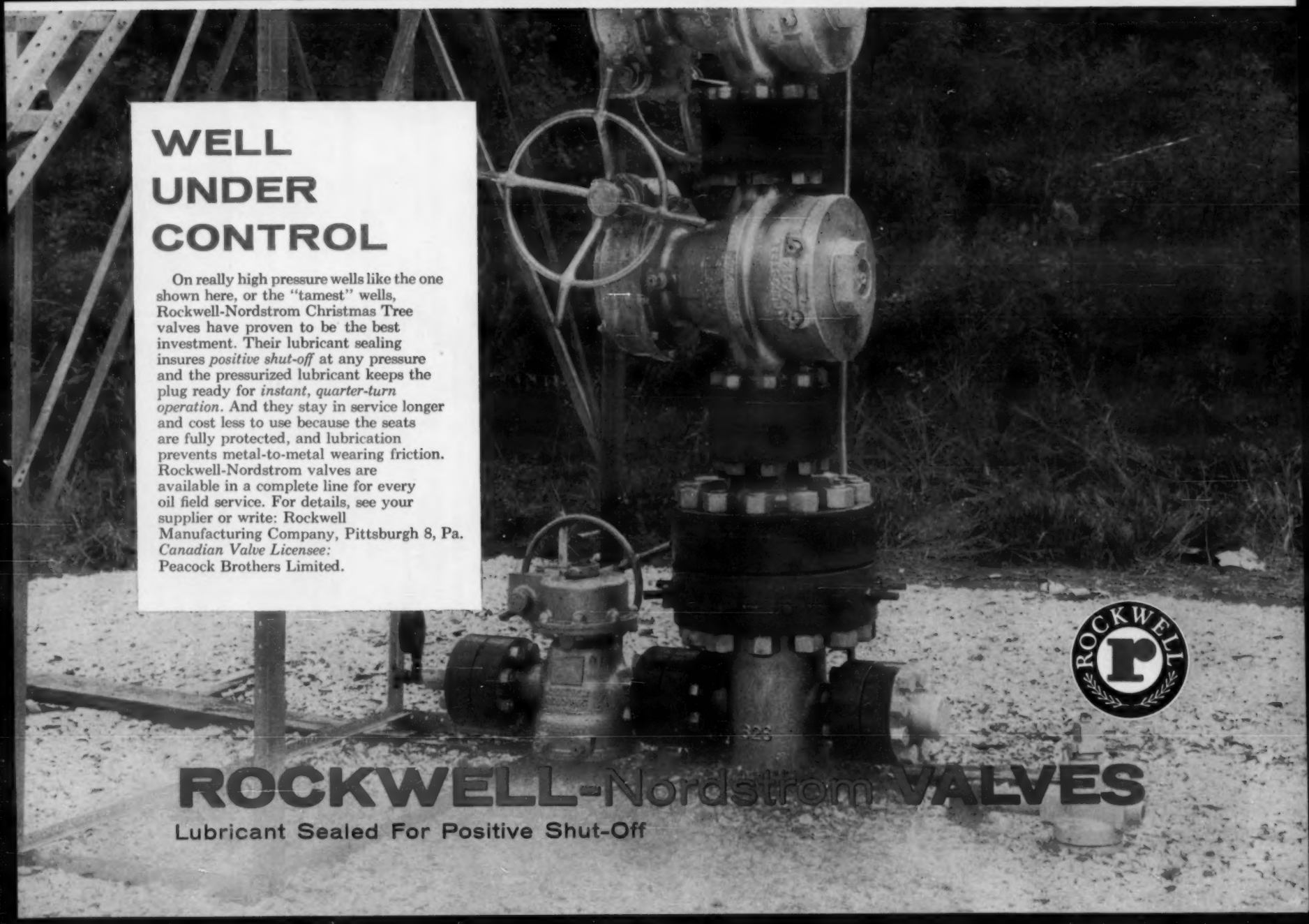
You get an extra unit in less space with Allis-Chalmers. *10* Allis-Chalmers units require only 340 inches.



ALLIS-CHALMERS

A-5518




WELL
UNDER
CONTROL
On really high pressure wells like the one shown here, or the "tamest" wells, Rockwell-Nordstrom Christmas Tree valves have proven to be the best investment. Their lubricant sealing insures *positive shut-off* at any pressure and the pressurized lubricant keeps the plug ready for *instant, quarter-turn operation*. And they stay in service longer and cost less to use because the seats are fully protected, and lubrication prevents metal-to-metal wearing friction. Rockwell-Nordstrom valves are available in a complete line for every oil field service. For details, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa.
Canadian Valve Licensee:
Peacock Brothers Limited.
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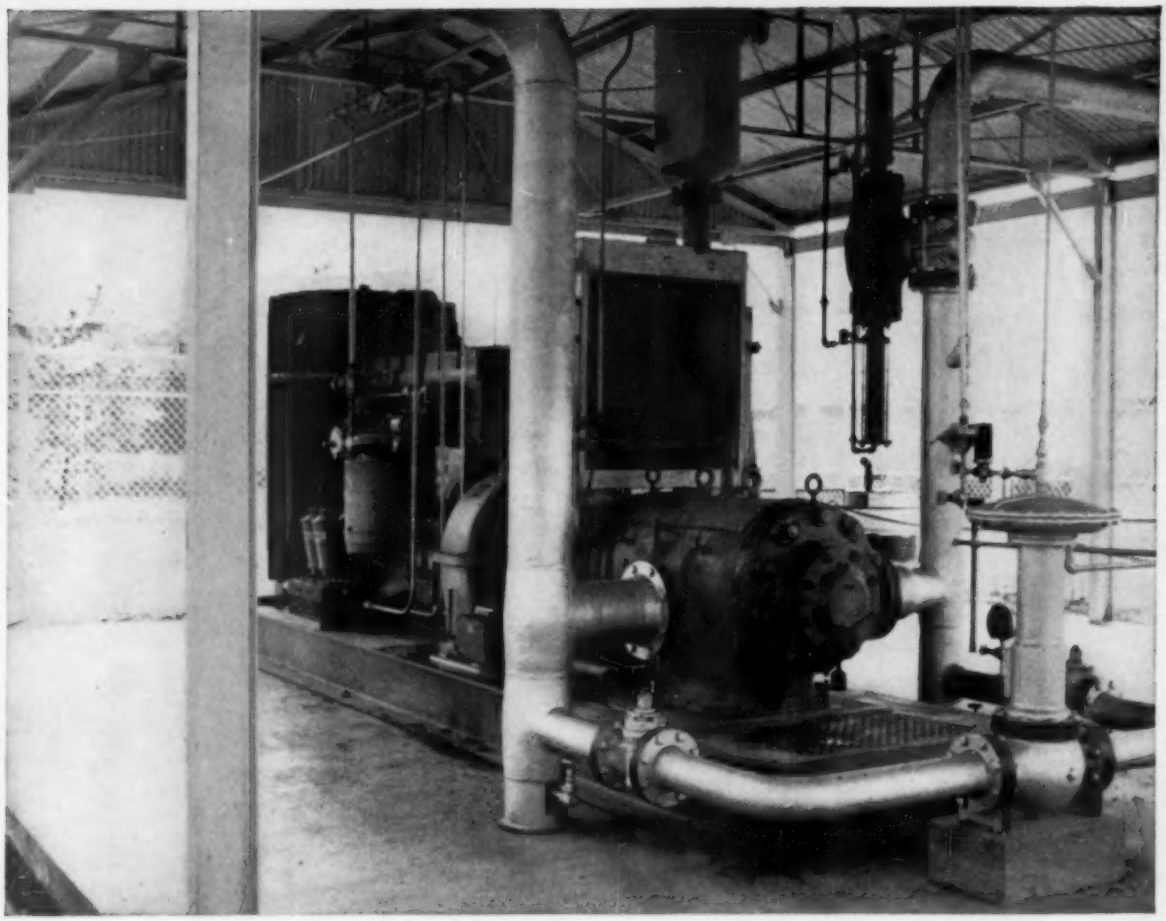
ROCKWELL-Nordstrom VALVES
Lubricant Sealed For Positive Shut-Off



TO START COMPRESSOR: PUSH BUTTON, EVEN MILES AWAY

Gas installations using Fuller Rotary Compressors have the advantage of remote-control operation, with the assurance of continuous peak performance under all weather conditions. Day and night operation under peak loads is possible with minimum supervision and maintenance. In the installation illustrated above, used for pumping from a gasholder into gas mains, the unit can be started and stopped at the unit or at a remote-control station approximately six miles away.

Fuller Rotaries feature simplified design, with rugged construction. They are compact and economical in operation. Valves, crankshafts, pistons and many other moving parts are eliminated, assuring smooth operation.

Oil and gas men concerned with gas gathering, gas boosting, and refinery in-plant service, as well as special compressor operations, rate Fuller Rotaries tops in performance.

C-308
3751

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132 Bridge St., Catasauqua, Pa.
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
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Fuller

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

DOW CORNING CORPORATION

Silicone News

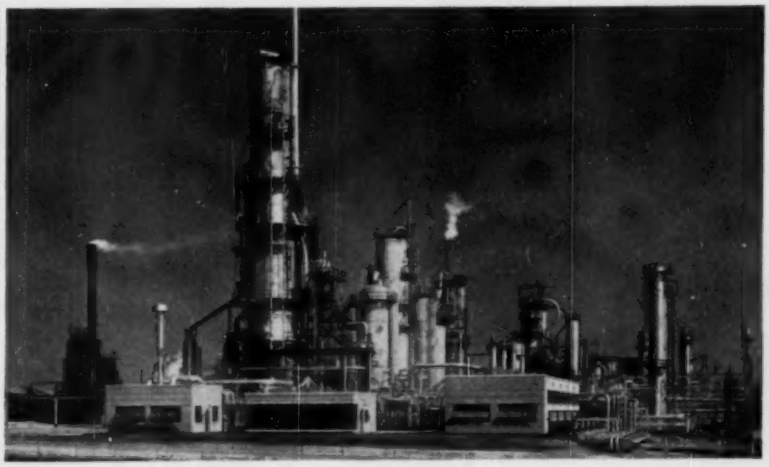
FOR PETROLEUM MEN No. 2

REDUCE GREASING SCHEDULES

Silicone lubricants can solve many a lubricating problem . . . even under desert conditions.

Exceptional heat stability and good resistance to oxidation and corrosive chemicals led Arabian American Oil Company to select a silicone lubricant for the stems of Hammel-Dahl diaphragm valves handling salt water in Near East installations.

Aramco found that Dow Corning 44 Grease kept the valve stems in excellent working order, and cut relubrication schedules appreciably. Results were so good that they now use this silicone grease in a host of well, pipeline and refinery applications. Maintenance costs have been reduced and important inventory economies realized by standardizing on 44 Grease for a variety of jobs. *No. 5*



HOW TO CUT MAINTENANCE WITH SILICONE PAINTS

Here's how one refinery made its plant a veritable tourist attraction, and at the same time made substantial cuts in maintenance costs, by using heat and weather resistant silicone finishes.

Keenly aware of the value of public relations, the Cosden Petroleum Refinery at Big Spring, Texas, painted its entire plant in a bright silver and gold color scheme, with gleaming green, red, and black trim. However, no ordinary paint could take the 300 to 900 F surface temperatures on stacks, furnaces, crackers, and similar units. Several expensive repaintings per season were needed.

Then, in the spring of 1953, Cosden tried a silicone aluminum finish on their huge catalytic cracker. The paint, made with heat resistant Dow Corning silicone resins, was formulated by the Cactus Paint Company. It did an amazing job, retaining a "like new" appearance for three years, despite the heat of the cracker. Consequently, Cosden began specifying silicone based paints for all its high temperature applications.

Cosden has saved a lot of paint and painting time, and the public is being treated to a refinery so attractive that the local citizenry point it out with pride. *No. 4*

Now: More Production With Silicone-Rewound Motor

Could you use more horsepower from your present motors? Here's an easy, economical way to get it.

To obtain a desired increase in production from existing equipment, it was first necessary for Leonard Refineries of Alma, Mich., to speed the feed of catalyst to a cracker. But their 35 hp, 3600 rpm motor couldn't handle any more load. And a larger motor would mean expense and delay.

Solution: Leonard had the old motor rewound with Dow Corning silicone insulation. Silicone insulation allows a motor to work harder without danger of burnouts. Rewinding took only a few days, and the total cost of the rewind was far less than that of a new motor. The rewound motor delivers the needed horsepower; the catalyst conveyor now runs 22% faster, increasing cracker throughput. *No. 6*

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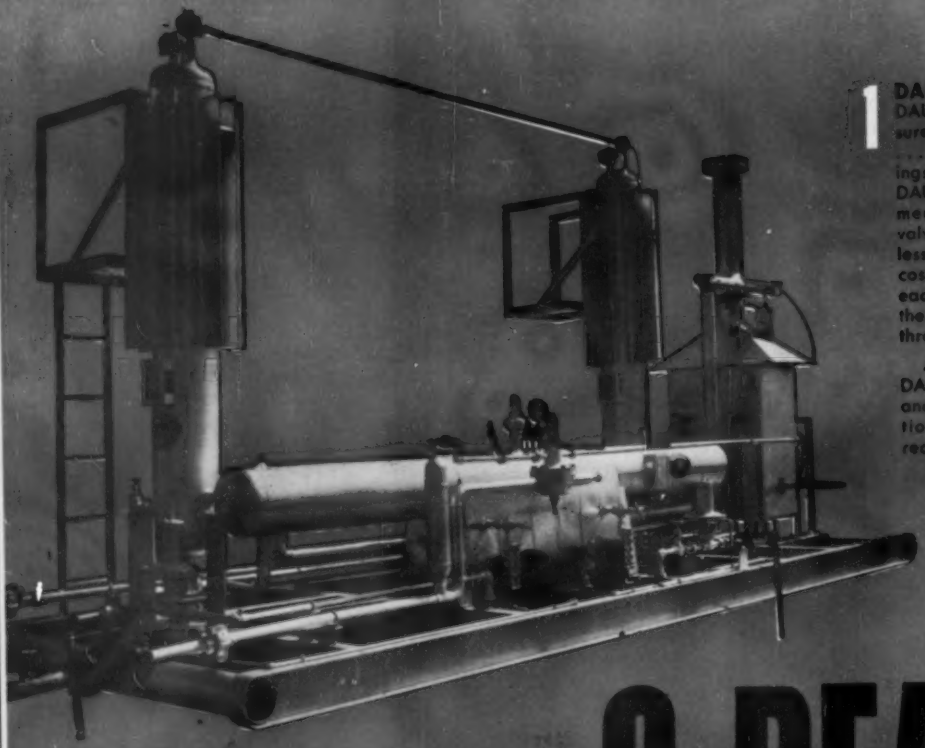
Canada: Dow Corning Silicones Ltd., Toronto; **Great Britain:** Midland Silicones, Ltd., London; **France:** St. Gobain, Paris



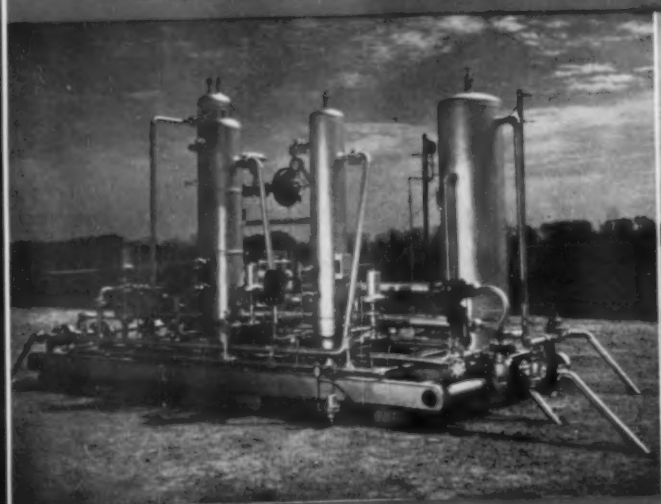
1 **DAU . . . a Parkersburg exclusive! With** DAU, wellhead dehydration of high pressure gas wells is possible for the first time . . . and with real economy, too. Your savings start with the low cost of unit. The DAU requires no costly auxiliary equipment such as separators, piping and valves. Because the DAU uses 80 per cent less fuel gas, your savings on operating costs can amount to hundreds of dollars each month. And checking corrosion at the wellhead saves on equipment wear throughout the flow system.

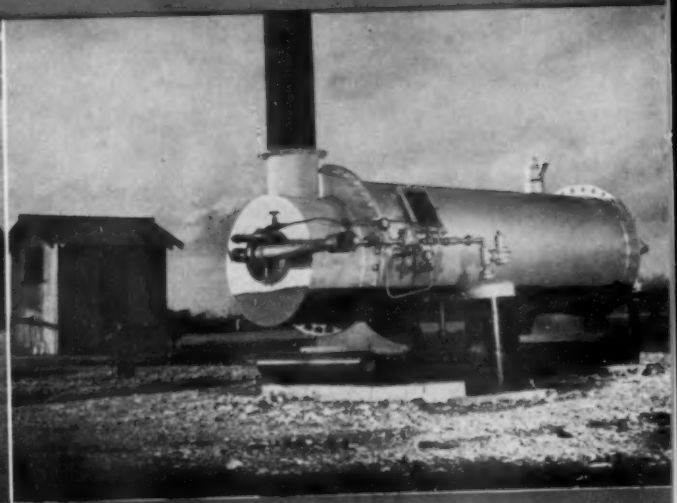
Available in two basic types: (1) The DAU Weldrier for wellhead dehydration; and (2) The DAU Welsorber for combination dehydration and hydrocarbon recovery.

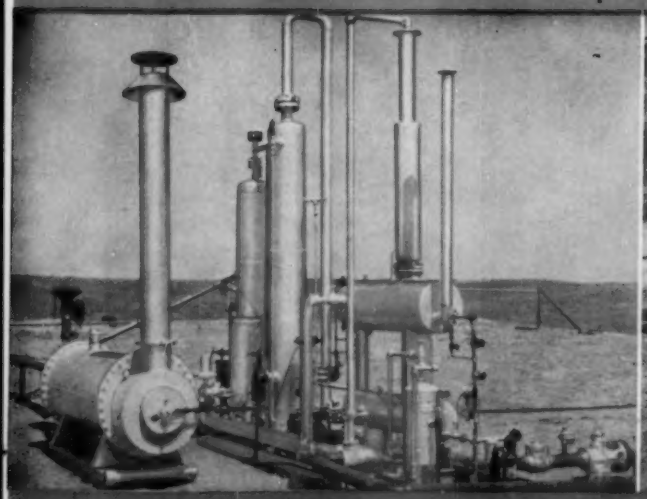
6 REASONS

2 **HYBECO . . .** another significant Parkersburg development. Parkersburg pioneered the design and development of this equipment to obtain high recovery rate by cold separation. Top performance attained through such Parkersburg features as use of horizontal and vertical separators to isolate warm liquid zone from cold gas zone for maximum recovery and minimizing danger of freezing; vertical knockout for complete removal of liquids before well stream enters cold zone of high pressure separator; and liquid level controller, used to regulate elimination of hydrocarbons from warm zone of separator, that gives hair trigger sensitivity, freedom from freezing, and freedom from plugged bleed holes. Available in capacities from 2.5 to 15 MMCF/D; pressures from 2000 to 6000 psi with either single tube or twin tube vertical knockout for liquid removal.

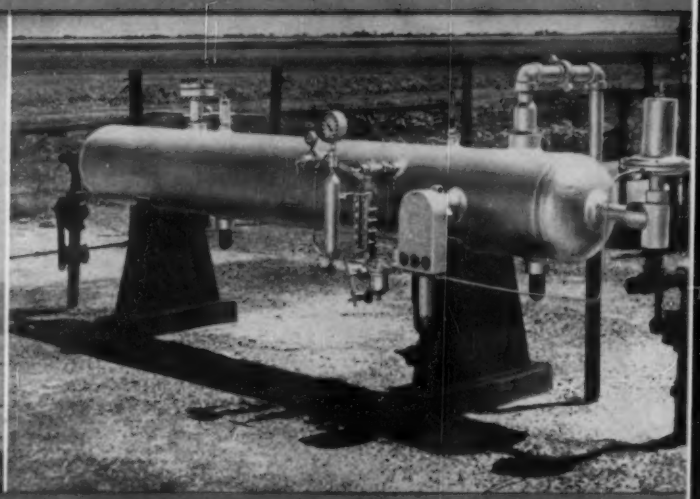
3 **HEATERS . . .** superior quality and performance. Parkersburg heaters are available in both direct fired and indirect heater types with capacities from 90,000 to 4,000,000 BTU's. Exclusive heating tube design eliminates hot spots and scale deposits, gives more efficient, economical and dependable service. Indirect heaters now feature new, modern jet-type burner and pilot that requires no air-fuel adjustment, gives maximum flame stability because only primary air is used with fuel gas, and, because of design of wall-tight burner box and flame stability, is practically immune to ill effects from crosswinds. Finest auxiliary control equipment available insures peak effectiveness. All valves and regulators used on Parkersburg heaters are designed for oil field application.







4 **GLYCOL TYPE GAS DEHYDRATOR** ...a self-contained, completely automatic unit that will eliminate most hydrate problems. Proven performance in extremely cold temperatures. Economical operating cost, using natural gas as source of power. Available in standard sizes to handle up to 10,000 MSCFD and up to 1500 psi operating pressure.



5 **OIL AND GAS SEPARATORS** . . . available in vertical and horizontal types. Parkersburg single-tube separator gives more gas flow area, more interface area and more retention time for greater separation. Whether your need is for a single-tube, two stage, three phase, vertical or metering separator, there is a Parkersburg separator to fit your requirements.

WHY

Parkersburg

Is the First Name in Production Processing Equipment

We are known by the equipment we keep. Parkersburg production processing equipment is the recognized leader in the field . . . a leadership gained through pioneering new designs and applications of equipment to meet any field problem. Operators everywhere buy Parkersburg with confidence because they know the superior performance that is built into each piece of equipment. If it is a Parkersburg, it is designed right and built right for leadership and engineered to meet specific field conditions.

The Parkersburg representative in your area will appreciate the opportunity to discuss specific equipment needs with you.

6 **EMULSION TREATERS**. . . designed to cover a wide range of applications. Safe and easy to operate. Equipped with unitized fuel gas control line and wind-proof burner control hood. Large free-water knockout capacity, adequate oil settling height. You get more specific separation of emulsion into clean oil and water, greater maintenance of high gravity oil.

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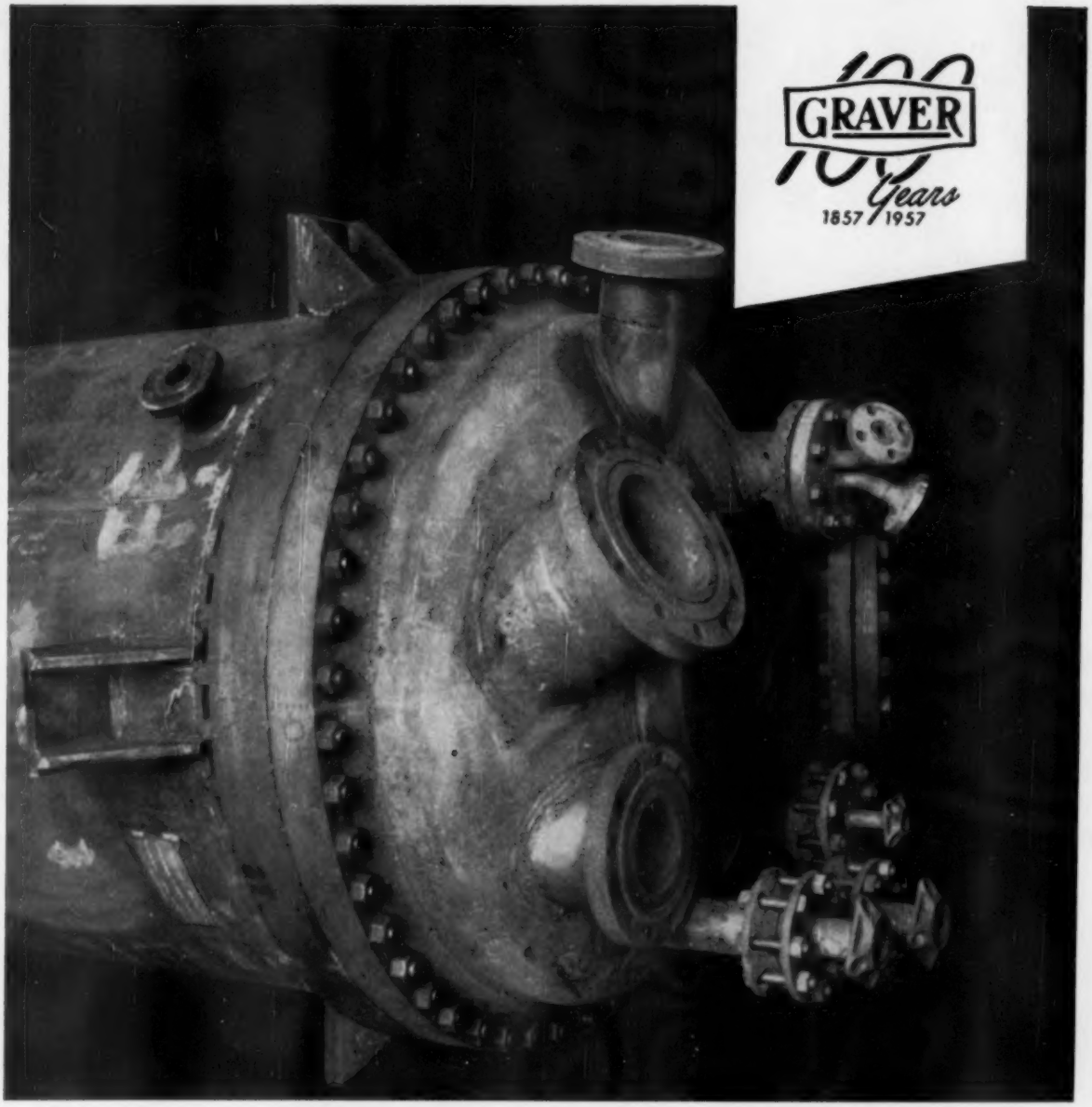

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. . . for more efficient processing equipment operating at higher pressures and temperatures, experienced fabricating skills are important. This pressure vessel in carbon steel, designed to withstand 300 psi at 270°, is one of many types of vessels Graver fabricates to customer requirements in conformance with the ASME Code. Eminently satisfactory performance and long-life is assured when Graver's century-aged skills are employed. When high pressures and temperatures are involved, it is a sound decision to discuss your requirements with Graver.

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MR. LON ARMSTRONG
P.S. Lord Company
Portland, Oregon

* "SCOTCHRAP" is tough polyvinyl chloride plastic in pressure-sensitive tape form. Strong; conformable; sticks at a touch.

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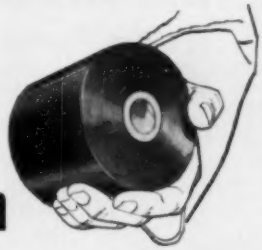
USE of Betzel Tapester speeded application to long lengths of pipe. Joints and fittings were hand wrapped.

JOINTS, elbows, tees, etc. are quickly wrapped by hand for perfect protection. Polyvinyl chloride "SCOTCHRAP" is tough, stretchy, conformable . . . positively seals out moisture and corrosion for permanent pipe protection.

GET THE COMPLETE STORY: Send for free booklets describing protective qualities and easy application of "SCOTCHRAP." Just write on your letterhead to 3M Co., St. Paul 6, Minn., Dept. EU-117.

The modern pipe protection that comes in rolls.



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3M

New light-duty Apache—Series 31 pickup

New Step-Van—One of three new Forward Control models in Apache Series

NEW 1958 CHEVROLET TRUCKS WITH

Just look at all they offer that's new and better . . . and you'll see why these new Chevies are the fleetest, sturdiest, handsomest dollar-savers yet! Meet Chevrolet for '58!

THREE NEW MODEL LINEUPS!

It's the biggest, most versatile Task-Force fleet yet —with an appetite for work to match! Every model sports fresh, broad-shouldered styling. And there's new hard-pulling power in every weight class, too—from the handy, handsome pickups to strapping tandems with GCW ratings all the way up to 50,000 lbs.

Just name your job. Your Chevrolet dealer will gladly name the new Apache, Viking or Spartan model to do it faster, easier and more economically than any other truck on the road!

NEW LIGHT-DUTY APACHES

Nifty, thrifty Apaches—built to outwork anything in their weight class—offer three completely new

SEE THE LATEST EDITIONS OF THE "BIG WHEEL" IN TRUCKS—

New heavy-duty Spartan—Series 90, L.C.F. model *New medium-duty Viking—Series 60 cab and chassis*

NEW HUSTLE! NEW MUSCLE! NEW STYLE!

Step-Vans equipped with walk-in bodies. The expanded lineup also includes high-capacity panels, pickups and four-wheel drive trucks—with a model tailored to take on your most troublesome delivery chores. There's new pep and power in any engine you pick, too—whether it's a 6 famous for economy or a short-stroke high-compression V8.

NEW MEDIUM-DUTY VIKINGS

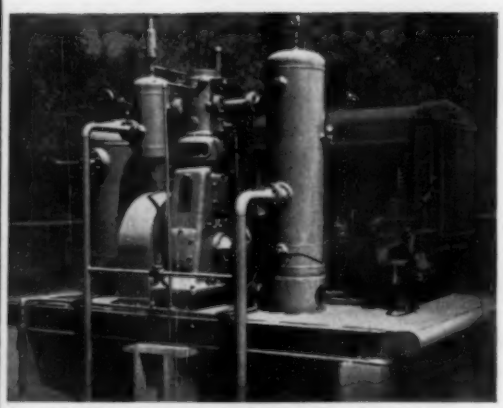
Hardy, hard-working Vikings roll in with nine brand-new models, offering new cab-to-rear-axle dimensions for improved semi-trailer, dump, stake and van-type operations. Options available on these and most other new models boost GVW ratings all the way to 21,000 lbs.—as high as many competitive heavyweights. Yet you get traditional Chevrolet economy from high-compression engines that include the industry's most popular 6's and V8's packing up to 175 h.p.

NEW HEAVY-DUTY SPARTANS

The robust Spartans make hauling history with the most revolutionary truck engine in decades—the Workmaster V8 with Wedge-Head design. The combustion chambers are in the cylinder block! Featured in Series 90 and 100 heavyweights, this 230-h.p. engine achieves a new high in efficiency. There's also an 18,000-lb. rear axle to go with it, an optional high-tonnage 9,000-lb. front axle and cast-spoke wheels on every model. Look over Task-Force 58 at your Chevrolet dealer's. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

1958 CHEVROLET TASK·FORCE TRUCKS! CHEVROLET

THE ONLY MODERN-DESIGN COMPRESSORS FOR GAS BOOSTER OPERATION



Joy WGB-110 Gas Compressor. Inlet pressure 150 psig; Discharge pressure 500 psig. Capacity 1.028 MMCFD.

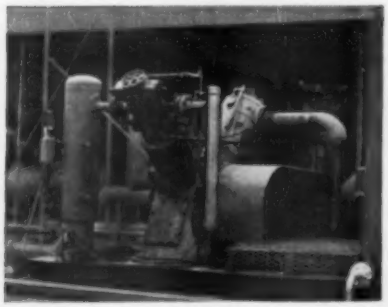
JOY *Packaged* GAS COMPRESSORS

Modern Joy Packaged Gas Compressors are backed by a century-old reputation for low maintenance and long service. These *time-proved* features make Joy Compressors the most reliable for gas gathering, repressuring, or gas lifting:

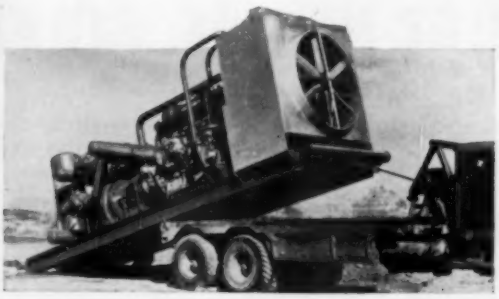
- **Field-replaceable cylinder liners.**
- **Field-replaceable crosshead guides.**
- **Patented Joy "Dual-Cushion" valves.**
- **Full force-feed lubrication.**
- **Anti-friction main bearings.**

Joy Gas Compressors are available in space-saving vertical, V-type, and semi-radial designs . . . single or two-stage units with cylinder sizes from 3″ to 13½″. Four different frame types accommodate a power range of 50 to 400 HP.

For the most efficient compressor for your needs, consult a Joy Engineer or write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Joy WNB-112 Gas Compressor. Inlet pressure 35 psia; Discharge pressure 665 psia. Capacity .85 MMCFD.



This photo of a Joy WNB-114 Gas Compressor Package being unloaded onto concrete pad clearly illustrates portability of unit. Inlet pressure is 5 psig; Discharge pressure is 150 psig. Capacity 2 MMCFD.

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Seventeen different charts and tables cover such data as relative heat content, vapor pressure-temperature, dilution, and specific gravity vs. temperature of caustic soda solutions. Plan now to put this colorful, compact book (6¼" x 9½") in your reference files.

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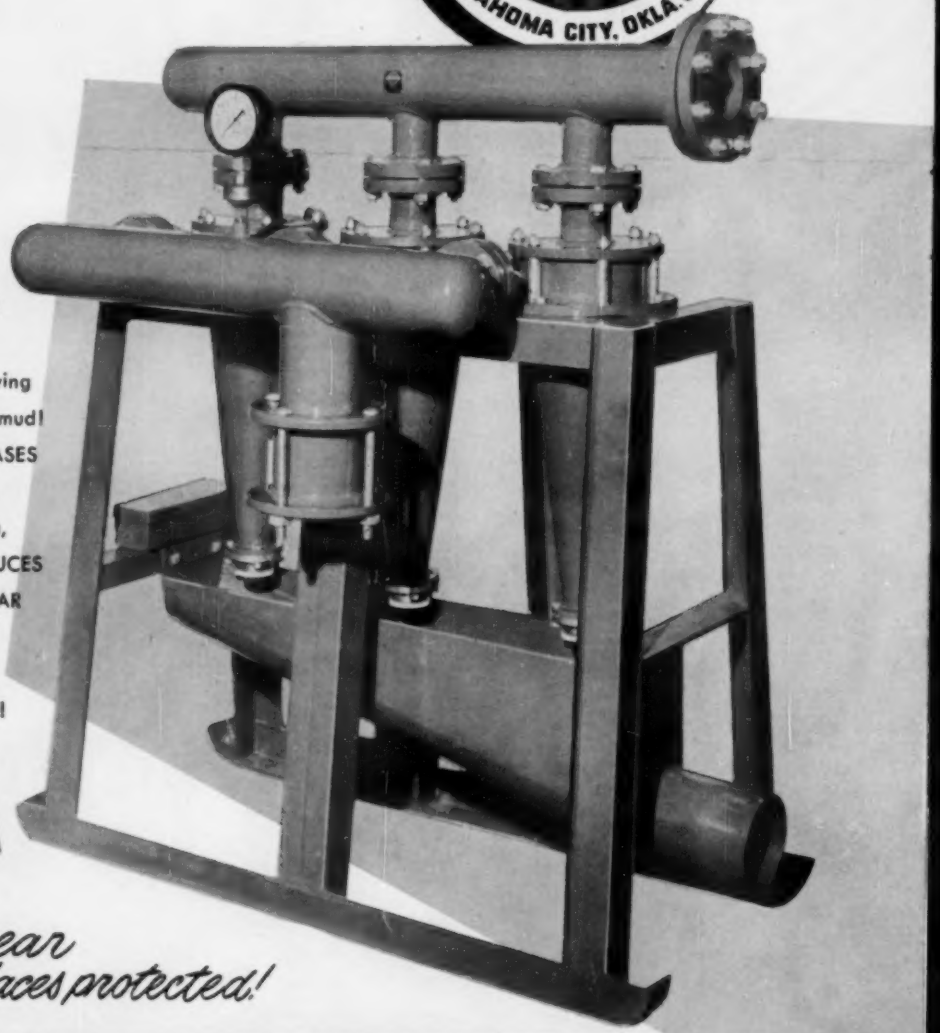
DRILLING EQUIPMENT MFG. CO.
OKLAHOMA CITY, OKLA. U.S.A.

CUT COSTS WITH A DEMCO DESANDER!

HERE'S the SURE WAY to SAVE valuable weighting and lost circulation material while removing sand and cuttings from drilling mud! CONTROLS mud weight, INCREASES bit life, INCREASES penetration rate, DECREASES lost circulation, REDUCES mud consumption, REDUCES pump repair costs, REDUCES WEAR on drill pipe, mud lines, tool joints and valves! SAVES MUD, TIME and MONEY!



PLUS FACTOR!

All wear surfaces protected!

THE PLUS FACTOR MAKES DEMCO PRODUCTS **BETTER!**

MUD GUNS . . . Pivot, Bottom and Spinner types
AUTO-FLO Mud Hoppers
MUD MIXERS

HYDRAULIC CHOKE NIPPLES
SAFETY RELIEF VALVES

COMBINATION CASING and BLOWOUT PREVENTER TESTERS

WRITE TODAY FOR DETAILS AND PRICES!

DESANDER!

PLUS FACTOR

GREATER CAPACITY . . . THE DEMCO DESANDER will treat 150 to 250 gallons of drilling mud per minute per cone! A two cone unit will treat 300 to 500 gallons per minute, depending upon mud viscosity, weight, and sand content! UP TO TWICE THE CAPACITY OF COMPETITIVE EQUIPMENT!

PLUS FACTOR

GREATER VERSATILITY . . . OVERFLOW header and underflow trough may be turned 180 degrees for maximum versatility and ease of connecting. DEMCO DESANDERS are available in one cone, two cone, three cone, or four cone units to adequately meet all capacity requirements up to 1000 gallons per minute. DESANDER may be integrally or separately mounted with pump and power unit to meet varying installation requirements.

PLUS FACTOR

GREATER EFFICIENCY . . . DEMCO DESANDER REMOVES 77 to 100 PERCENT of sand and cuttings in a WIDE PARTICLE SIZE RANGE of 20 to 325 MESH! Doesn't require excessive pressure . . . OPERATES MOST EFFICIENTLY at gauge pressure of 35 to 40 lbs. . . . doesn't tie up expensive slush pump!

PLUS FACTOR

STRAIGHT LINE FLOW . . . MUD MOVES in a straight line into and away from all headers . . . less resistance . . . less friction . . . less wear . . . more efficient!

PLUS FACTOR

LONGER LIFE . . . The DEMCO DESANDER is designed for MAXIMUM SERVICE LIFE . . . all MAJOR WEAR SURFACES are protected by ½-inch ABRASIVE RESISTANT BUTYL COMPOUND . . . all easily and economically REPLACEABLE! METAL CONES retain original dimensions . . . lining takes the wear! SIGNAL HOLES in cone LET YOU KNOW IMMEDIATELY if relining is necessary! Underflow ORIFICE is HARD CERAMIC only one point less hard than a DIAMOND! NOTHING IS LEFT TO CHANCE in a DEMCO DESANDER!

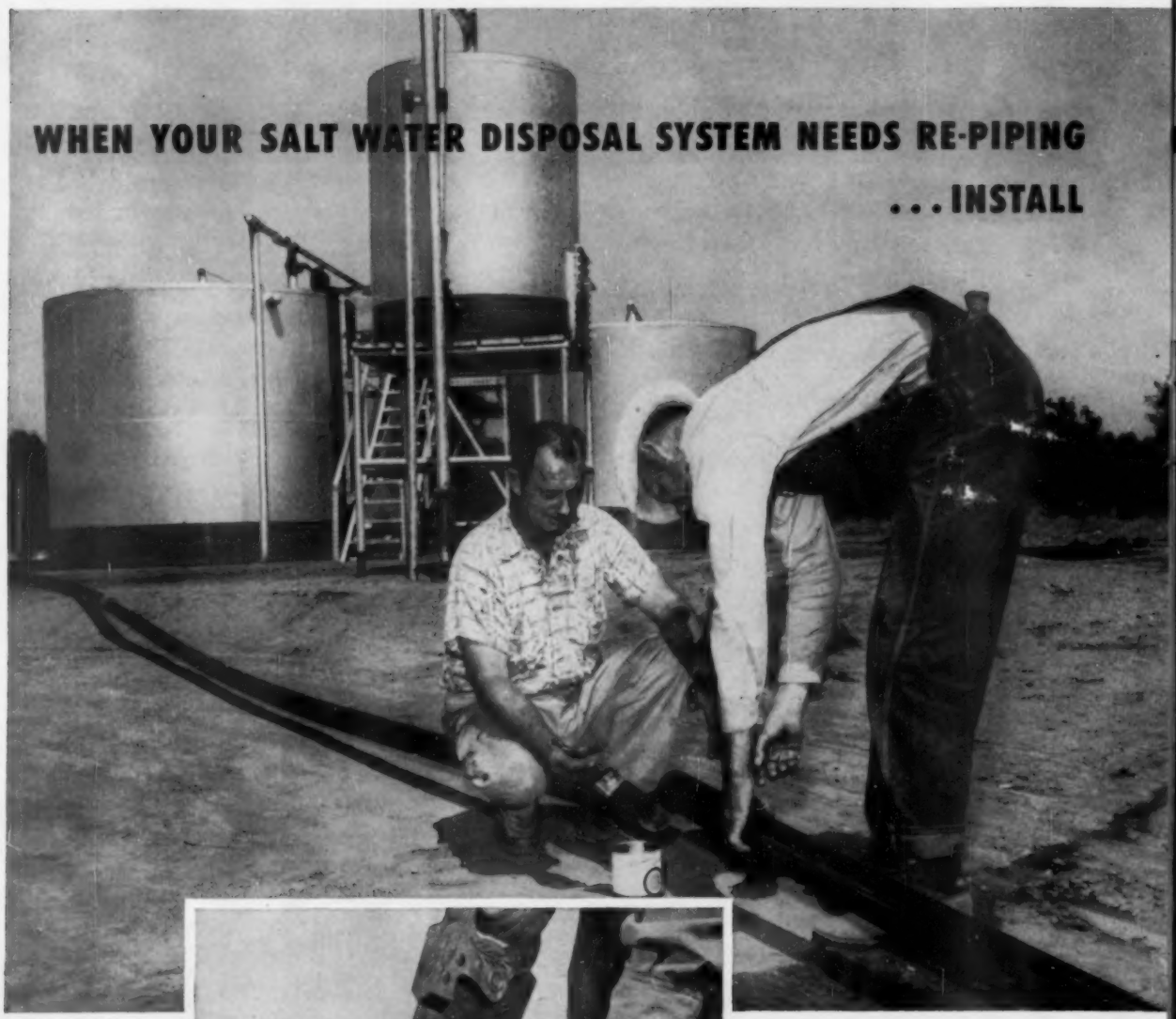
AVAILABLE IN ANY DESIRED CAPACITY!

DRILLING EQUIPMENT MFG. CO. DEMCO OKLAHOMA CITY, OKLA. U.S.A.

MODEL 20-2 CONE COMPLETE ASSEMBLY

DRILLING EQUIPMENT MANUFACTURING CO.

P. O. BOX 4728 OKLAHOMA CITY, OKLA.



EASY TO HANDLE . . . CUT . . . JOIN . . . DITCH! Republic SRK Plastic Pipe is extremely lightweight, can be cut with an ordinary handsaw. Joining is easy, using brush-applied solvent. Simply coat inside of fitting, outside of pipe with cement, stab pipe into fitting, give ⅛ turn and the job is done. And the "weld" is permanent.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

REPUBLIC SRK

the plastic pipe that takes the bite out of corrosion

...and your pocketbook

Replacement costs will virtually disappear, because salt water *will not harm Republic SRK.* Furthermore, this amazing rubber-resin pipe is so versatile it has become a favorite for handling natural gas, oil—and many other liquids as well.

Principal reason lies in the unique advantages of this rugged pipe—advantages unmatched by any other pipe material.

It's easy to transport. Because Republic SRK is extremely lightweight, one man can carry several lengths with little effort. And once made up, he can ditch the pipe by himself.

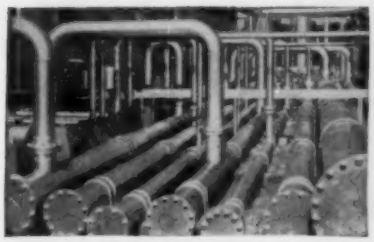
It's easy to install. Republic SRK can be installed quickly and easily—even by workers with no previous experience in laying plastic pipe. Any ordinary handsaw will cut it. And it takes only seconds to join permanently with a brush-applied welding solution. This speed of assembly keeps installation costs down.

It's easy to maintain. Republic SRK's resistance to electrolytic action, corrosive oils and salt water, guarantees long life, fewer replacements. A carbon-black additive makes it resistant to deterioration from the sun's ultraviolet rays.

Because it's extremely tough, Republic SRK will stand up under rough treatment. Impact strength is high—and over a wide range of temperatures. Available in sizes from ½" through 6 inches in a wide range of pressure ratings.

Republic also makes Semi-Rigid Butyrate (SRB) for areas where paraffin conditions are extremely severe. It will pay you to investigate both Republic SRK and SRB. To get the complete story, *send coupon today.*

PROTECT HIGH-PRESSURE EQUIPMENT with quality Republic fasteners. The alloy studs and high carbon hex nuts in these headers are built to withstand the most severe heat, pressure and corrosive conditions. Clean, accurate threads provide easy tightening, maximum holding power, resistance to wear, trouble-free backoff. Ask your distributor, or send coupon for details.



NEW TRUSCON® STEEL "BUDGET BUILDINGS" provide quick, economical protection for crews and equipment, on a permanent or temporary basis. They're fire-resistant, well-lighted, properly ventilated. Heavy galvanized coating resists corrosion, eliminates extensive maintenance problems—requires no painting. Rigid frame provides unobstructed floor area. Easy to erect, Truscon "Budget Buildings" can be readily dismantled and moved to meet changing conditions. For specifications on complete line, mail coupon.

CUT LINE-PIPE INSTALLATION TIME BY 33⅓ with new Super-Span Joints of Republic Electric Fusion Weld Line Pipe. *Sixty feet in length,* they require only 88 welds to make a mile of line. Welding crews making 150 girth welds per day will complete 9000 feet. This new length, a Republic exclusive, is produced by joining two 30-foot joints under ideal welding conditions. Comes in sizes from 24" through 30" O.D. Mail coupon for facts.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. C-3509A
3112 EAST 45TH STREET • CLEVELAND 27, OHIO

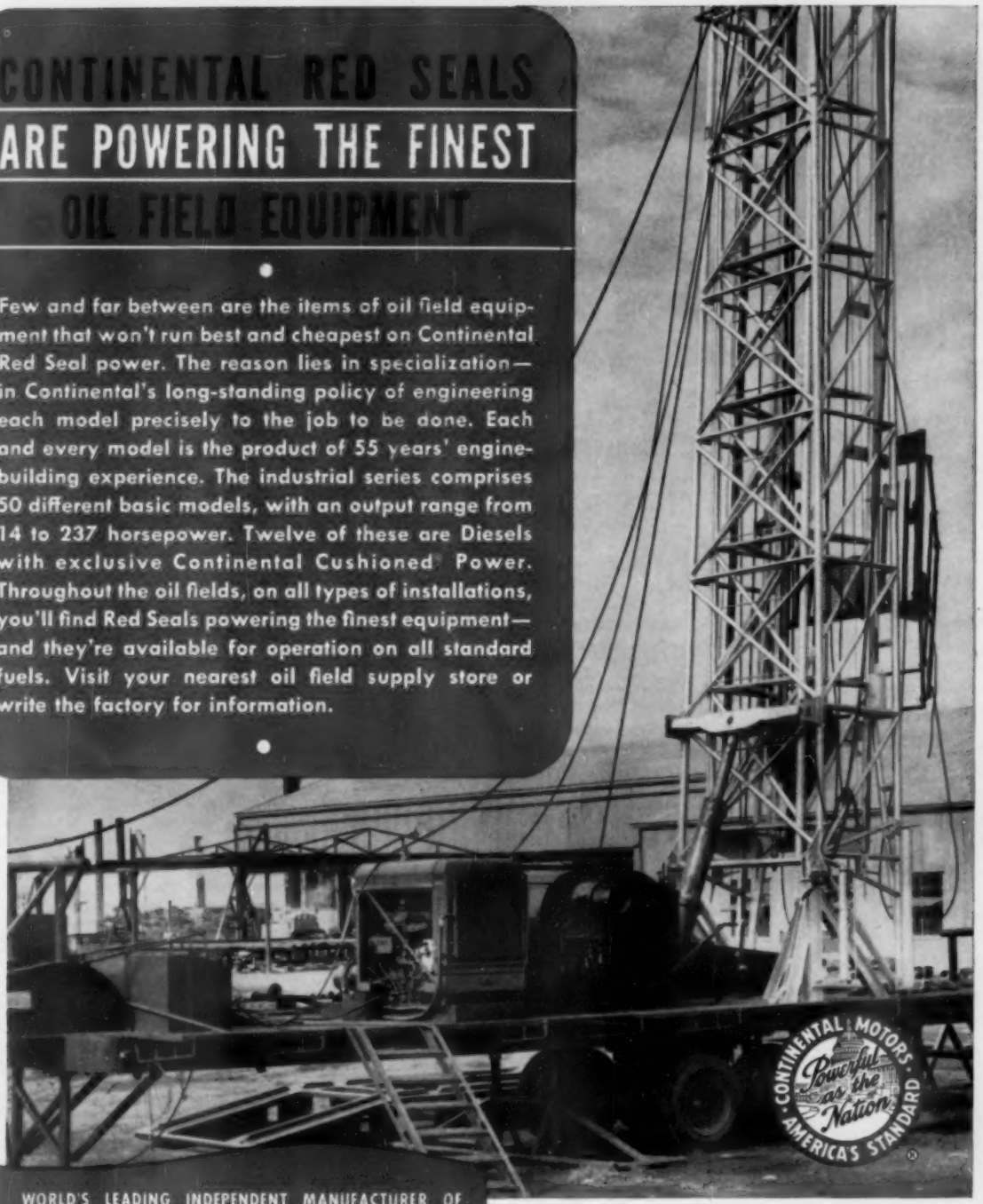
Please send me more information on:

☐ SRK (Kralastic) Plastic Pipe ☐ Fasteners
☐ SRB (Butyrate) Plastic Pipe ☐ Truscon "Budget Buildings"
☐ New Super-Span Joints of Republic Fusion Weld Pipe Line

Name_____ Title_____
Company_____
Address_____
City_____ Zone_____ State_____

CONTINENTAL RED SEALS ARE POWERING THE FINEST OIL FIELD EQUIPMENT

Few and far between are the items of oil field equipment that won't run best and cheapest on Continental Red Seal power. The reason lies in specialization—in Continental's long-standing policy of engineering each model precisely to the job to be done. Each and every model is the product of 55 years' engine-building experience. The industrial series comprises 50 different basic models, with an output range from 14 to 237 horsepower. Twelve of these are Diesels with exclusive Continental Cushioned Power. Throughout the oil fields, on all types of installations, you'll find Red Seals powering the finest equipment—and they're available for operation on all standard fuels. Visit your nearest oil field supply store or write the factory for information.

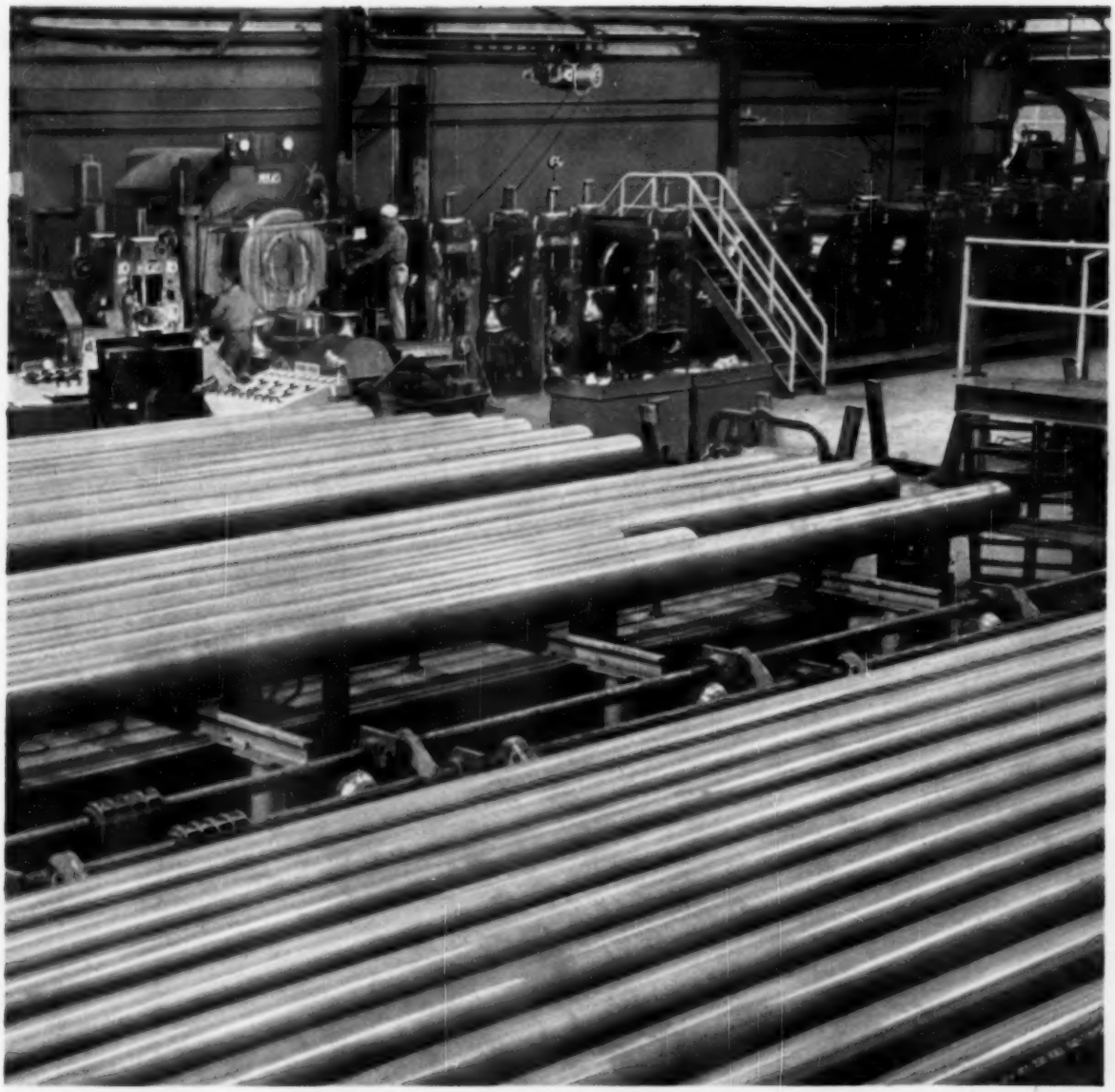


WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKEGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

FACTORY-APPROVED SERVICE AND GENUINE RED SEAL PARTS ARE AVAILABLE ALL OVER THE WORLD

Continental Motors Corporation

MUSKEGON • MICHIGAN



New J&L Electricweld Mill

produces line pipe from 6⅝" through 12¾" O.D.

Jones & Laughlin's new high speed Electricweld pipe mill is producing, in time for your 1958 requirements, electric welded line pipe in sizes ranging from 6⅝" through 12¾" O.D. in lengths up to 60 feet.

This modern mill includes several "firsts" that assure high speed, continuous production of quality electric welded line pipe for the gas and petroleum industries.

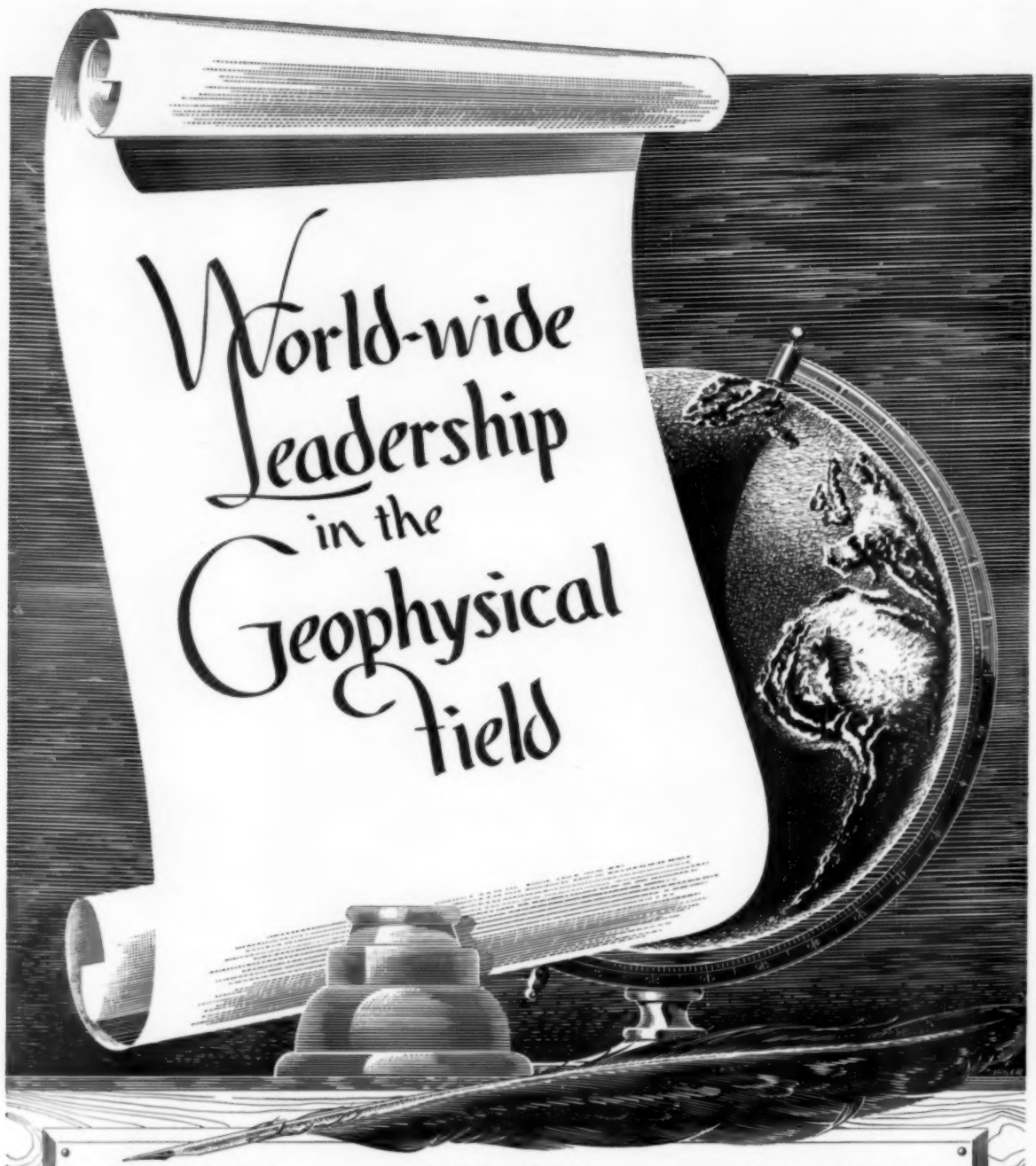
Among innovations are the feeding of 2,300-volt electric current directly into the welding transformer, increasing speed of response and availability of power at the weld; electronic measurement of a pre-determined forging pressure assuring the quality of the weld; "Vacu-Blast" treatment of weld area to remove scale.

All pipe is carefully finished and tested to meet ASTM and API specifications. Investigate J&L's new Electricweld line pipe today. Get all the details by writing Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

J&L STEEL

Jones & Laughlin

...a great name in steel



FOREIGN OPERATIONS

Western

GEOPHYSICAL COMPANY
INTERNATIONAL

DOMESTIC OPERATIONS

Western

GEOPHYSICAL COMPANY OF AMERICA

CANADIAN OPERATIONS

Western

GEOPHYSICAL COMPANY
OF CANADA, LTD.

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MILD TYPE ELECTROLYTE
NOT DAMAGED BY OVER-CHARGE
HIGHER TERMINAL VOLTAGE
THE Cadmium Battery
SHOCK-RESISTANT CASE
SINTERED CADALLOY PLATES
GREATER ELECTROLYTE CAPACITY
TURNS ENGINE OVER 25% FASTER IN R.P.M. TEST
MAKES LIGHTS 50% BRIGHTER
RECEIVES POWER IMMEDIATELY AFTER COMPLETE, RAPID DISCHARGE
GIVES FOR MORE THAN 500,000 STARTS
WILL NOT FREEZE – STARTS ENGINES INSTANTLY AT ARCTIC AND DESERT TEMPERATURES

ANNOUNCING!

THE *Cadmium Battery*

a genuine cadmium battery
GUARANTEED TO OUTLAST YOUR CAR!

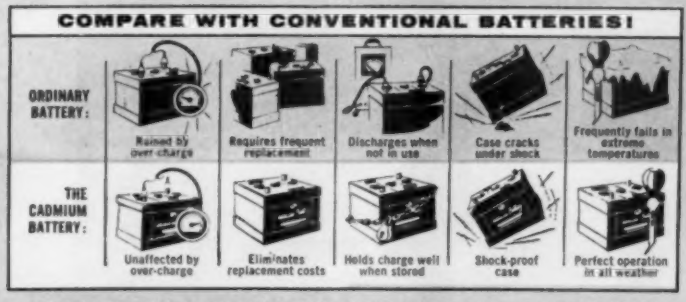
You—and the public—have been hearing and reading for years about European-type Cadmium batteries that last longer than automobiles. But so far you haven't been able to buy such batteries.

Truth is, the European-type batteries simply aren't practical for ordinary motoring use—too big and too expensive. Now, after testing more than 400 different combinations of materials and many construction designs, an American manufacturer has at last developed a Cadmium Battery practical for general motoring use.

This revolutionary new type battery is different from any other American or European battery ever made. *It is superior to European-type Cadmium batteries, yet is no larger nor costlier than ordinary batteries!*

As a result of more than a year of continuous laboratory and road tests, The Cadmium Battery is unconditionally guaranteed *by the factory* to outlast your car.

COMPARE WITH CONVENTIONAL BATTERIES!



COMPLETE LINE OF INDUSTRIAL, COMMERCIAL, MARINE, MOTORCYCLE AND AIRCRAFT BATTERIES

The key to the remarkable capacity and long service life of The Cadmium Battery was the discovery of a method of sintering the grids with a newly-developed cadmium alloy. Both the composition of the Cadalloy (derived from cadmium), as well as the method of sintering, or forming, the grids are original and carefully guarded secrets which are highly important to the performance, characteristics and life of the unique Cadmium Battery.

The Cadmium Battery is the finest battery made in America. It gives "temperature-proof" faster starting, brighter lights, better operation of all the car's electrical equipment. Completely modern in every respect, it is designed for today's automotive electrical systems and is ideal for cars with full electrical equipment.

One price for all 6- and 12-volt passenger cars and light trucks: Only $39.95. Never before offered for less than $100.

Reader's Digest
Ask for free reprint of Readers' Digest article entitled: "The U. S. Finally Discovers the Lifetime Battery"

THE *Cadmium Battery Corporation*

140 KANSAS STREET, EL SEGUNDO, CALIFORNIA

EXCLUSIVE DISTRIBUTORS NOW BEING APPOINTED

The Cadmium Battery Corporation operates its own completely modern, 65,000 sq. ft. factory and is a financially responsible organization. If you are interested in acquiring a valuable distributor franchise (no charge for franchise) with a protected territory guaranteed in writing, contact us at once by telephone, wire or letter. Address John Galahad, Sales Manager, Cadmium Battery Corporation, 140 Kansas St., El Segundo, California. Phone: EAstgate 2-0367, El Segundo. Cable address: CADMIUM, Los Angeles.

THE CADMIUM BATTERY CORP., Dept. OGJ-117
140 Kansas St., El Segundo, Calif.

Please ship Cadmium Battery guaranteed to outlast my car, @ $39.95. Factory pays shipping to my door.

☐ 6-volt automotive ☐ 12-volt automotive

Year of Car_____ Model of Car_____

Make of Car_____ No. of Cylinders_____

Name_____

Address_____

City_____ Zone____ State_____

BUCYRUS-ERIE SPUDDERS
speed well fracturing, secondary recovery

BUCYRUS-ERIE spudders are built to handle your well workovers fast and economically. These modern rigs have the speed and mobility to assure rapid progress on hole after hole, with quick easy moves and reduced costs all down the line.

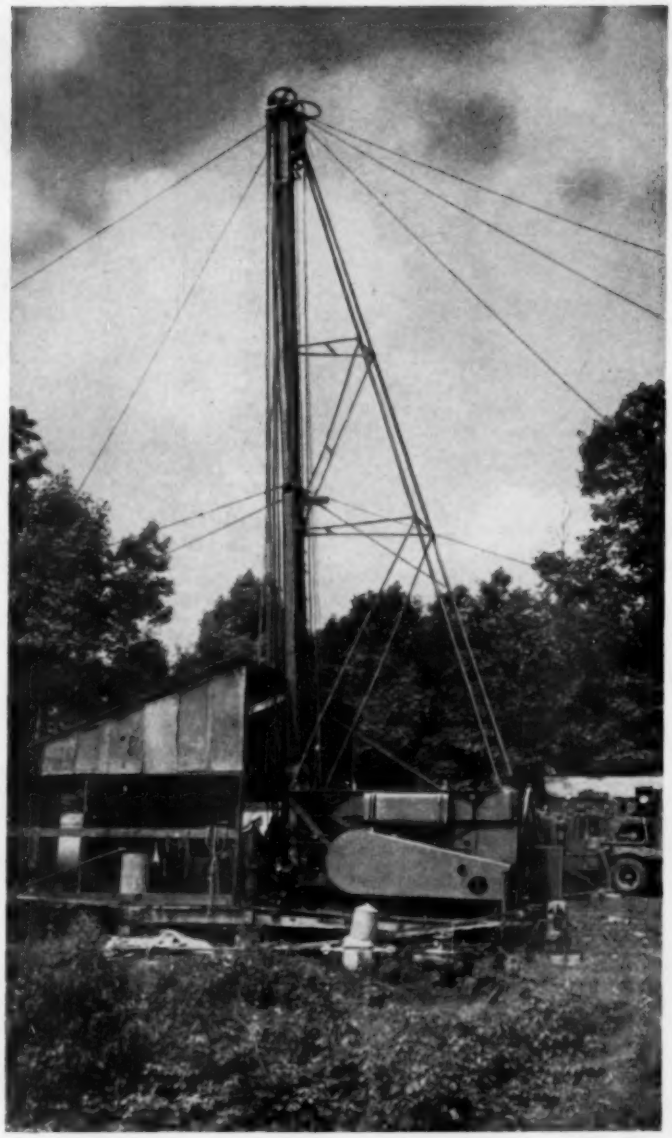
In drilling the injection wells required for a water flood operation, for example, you can't beat the snappy drilling action with which Bucyrus-Eries put down hole. Forward and reverse speeds on all reels and on the catheads provide accurate, split-second control. Reels are free-wheeling for lowering, and fast powerful line pulls ease handling of tools, packers, tubing, swabbing, etc.

In fracturing work, too, these rigs have plenty of speed, strength and capacity for setting casing, handling tubing strings, and running treatment packers.

And when it comes to moves, Bucyrus-Eries save time. Their telescoping derricks are lowered and raised quickly under power; tubular braces unfold smoothly. Mobile semi-trailers or skid mountings make moving easy.

Popular models for this type of servicing work are the 60-L, 28-L and 36-L spudders. Get all the facts from your nearby Bucyrus-Erie distributor or write direct.

42557



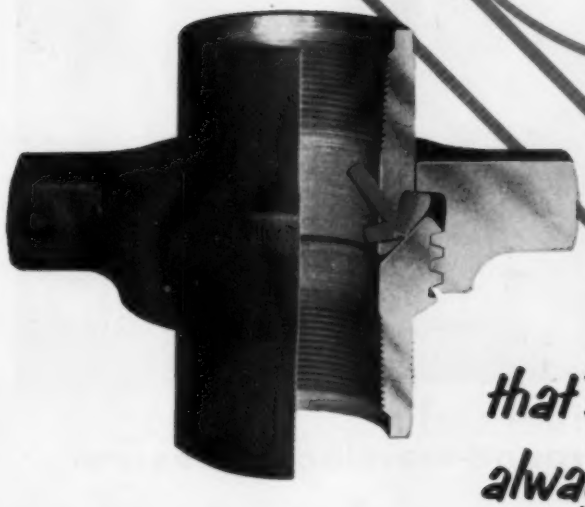
BUCYRUS ERIE

BUCYRUS-ERIE COMPANY

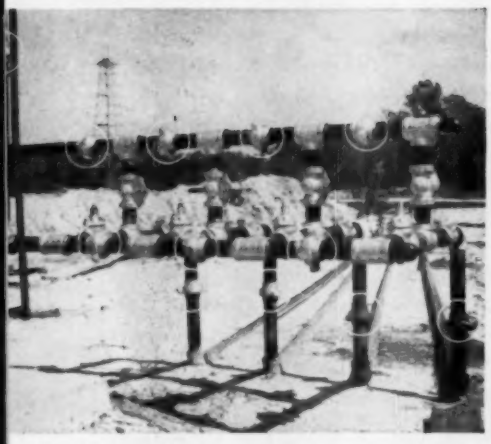
South Milwaukee, Wisconsin

First with the Finest in Spudders

nothing SEALS like a ball... in a precision-ground seat...



that's why WECO unions always form PERFECT SEALS



Years of field service on the toughest jobs, with pressures ranging to 15,000 psi, afford positive proof that nothing seals better than the ball and cone design of WECO Unions. The spherical surface of the male sub always forms a perfect seal against the conical surface of the female sub, providing a secure metal-to-metal seal time after time; a seal that refuses to leak under high pressures, shock, surge or vibration.

WECO Unions are durable as well as efficient. They have stronger subs and wing nuts, heavier wall construction, and sturdy Acme threads. These factors all add up to unions that take the toughest treatment as a matter of course—and come back for more—on hook-up after hook-up.

WECO Unions are available in sizes from 1" through 12", pressures from 1,000 through 15,000 psi—at supply stores everywhere.

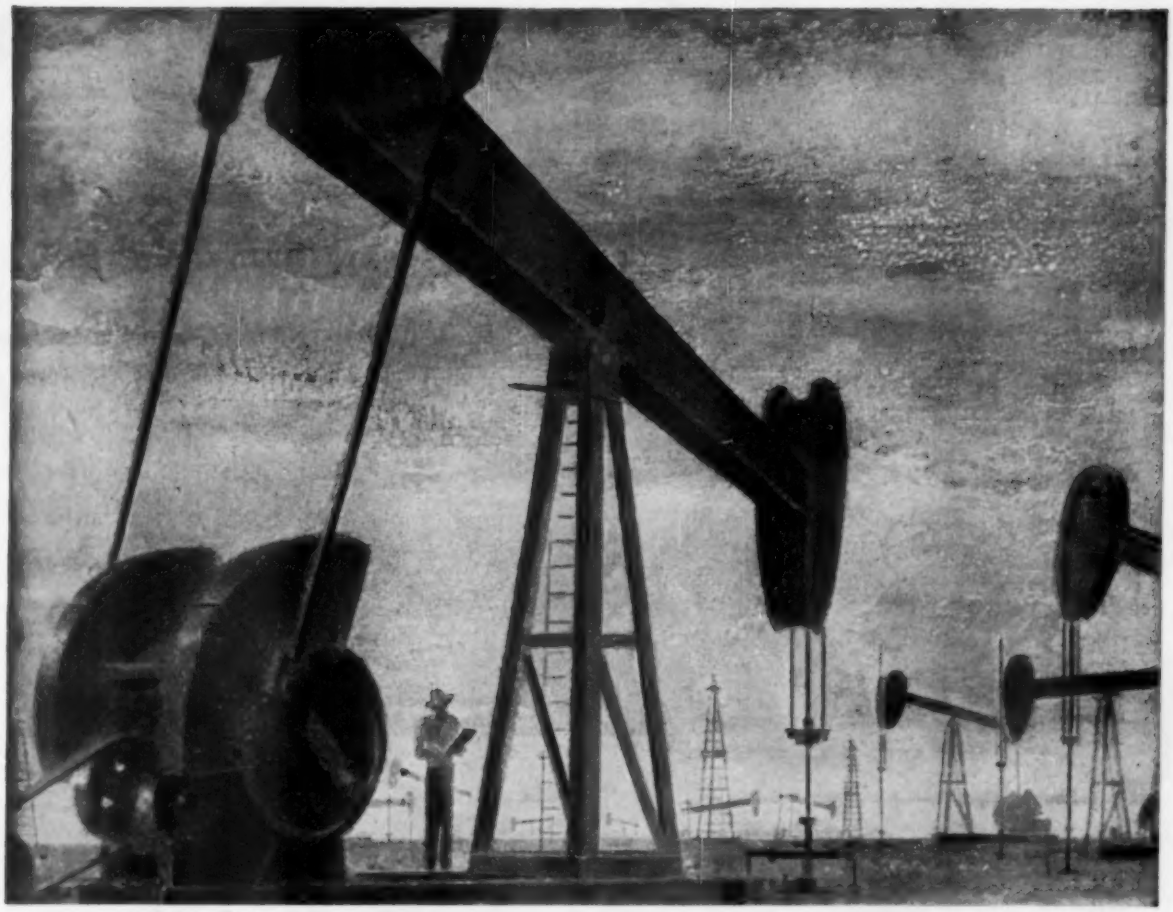
U-1-57

WECO®

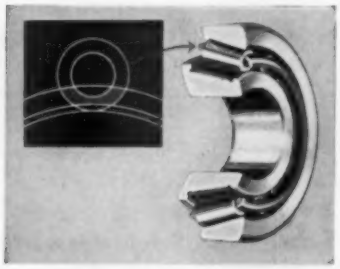
WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

fmc



Built to stand up . . . under 'round-the-clock pressure!



HIGHER FLANGE IMPROVES ROLLER ALIGNMENT

As shown by the gray area above, the higher flange provides a large two-zone contact area for the roller heads. This greatly reduces wear—practically eliminates "end play". Larger oil groove provides positive lubrication.

The flow of America's vital oil can't be regulated by a time clock! These bobbing pumps work around the clock, around the year—with virtually no attention whatever! Dependable Bower Roller Bearings are more than proving their ability to stand this back-breaking pace—doing it with a minimum of maintenance cost and down-time. That's because important Bower Spher-O-Honed design features, like the one shown at left, have reduced bearing failure to a rarity. Whatever test *you* put them to—tractors, machine tools, jet engines—you'll find that Bower Spher-O-Honed Bearings will last longer and operate more efficiently. Let a Bower engineer show you the many advanced design features and superior quality of the complete Bower line. There are tapered, straight and journal roller bearings for every field of transportation and industry.

BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 14, MICHIGAN

BOWER ROLLER BEARINGS

They Say—

What sparks creativity?

"Attainment of a stable, abundant society, despite a rapidly rising world population, depends upon the creativity of our scientists. I believe strongly that creativity is an individual function. It may be sparked by external contacts, it may be accelerated by group devices, but in the last analysis an idea must be generated by an individual.

"And I believe further that if an individual scientist is to be continuously creative, his individuality must be accentuated. He should be given an opportunity for individual initiative, be made aware of his individual responsibility, provided with individual rewards for individual productivity. To the extent that he is permitted or forced to submerge his own personality, to lose his individuality as a member of a group, to become a faceless, voiceless part of a mass, to that degree will his creativity be stifled."

Herman S. Bloch, deputy director of refining research, Universal Oil Products Co., in a speech to the Chicago chapter, American Institute of Chemists.

Only average profits in oil

"It is true that a few individual producers have spectacular—and well publicized—success in the oil business, and public resentment that their wealth should be increased by the operation of the depletion deduction is understandable.

"For every highly successful oilman, however, there are hundreds or thousands whose success is modest, or who lose money, for the risks are so much greater than in normal businesses. Certainly it seems hardly wise to penalize the industry in general in order to collect more taxes from the lucky or efficient few. That exceptional profit is not the rule in large companies is proved by a recent study covering the period 1938-1955 which shows that the average earnings after taxes of 90 large oil companies were 11.6 per cent of net worth, compared to 12.3 per cent for all manufacturing companies . . .

"In the last analysis, the most telling defense of the depletion deduction, it seems to me, is that it has worked . . .

Young

keeps vital engines cool in desert hot-spot!

1,000 hp units operate at full load in world's hottest location

Not even the fierce heat of Kuwait or general water shortage in the area can impair the efficiency of the Young equipment used to cool the jacket water, supercharger intercoller water and engine oil on the engines of the four 1,000 hp pumping units designed and built by the Enterprise Division of General Metals Corporation of San Francisco.

Young equipment identified above: (1) Radiator Model MWC-455 with separate cooling sections for jacket water-supercharger intercooler water and engine oil. (2) Young Mono Weld® construction turbo-charged air intercooler. (3) Model OCS-300 Torque Converter Cooler.

OIL FIELD AND PIPELINE REPRESENTATIVES

1. Central Station Equipment Co. Tucson, Arizona
2. Flournoy & Everett, Inc. Downey, California
3. Jones and Laughlin Bradford, Pennsylvania
4. J. R. Mesk Company Tulsa, Oklahoma, Houston, Texas
5. Frank Walz Denver, Colorado
6. Dutton-Williams Bros. Ltd. Calgary & Edmonton, Alberta, Canada
7. H. J. Young Muskegon, Michigan

"WHERE QUALITY COUNTS"

Write today to Dept. 207-L for catalog 1356. There is no obligation.

Young RADIATOR COMPANY

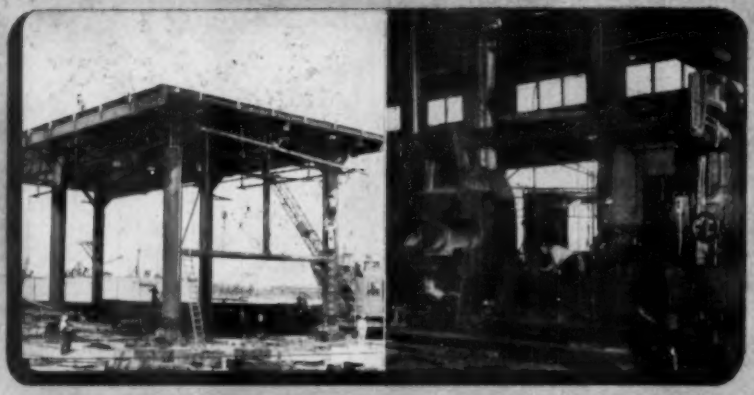
RACINE, WISCONSIN

Creative HEAT TRANSFER ENGINEERS

Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Matteon, Illinois

For Tidelands Oil . . .

Peak Capacity, Nearby



this is **AVONDALE'S** story

A map illustrates the fact . . . that in the fan-shaped riches of the Tidelands, there is one centrally-located point for construction and repair. That point is Avondale, with four major divisions compactly grouped in the New Orleans area. Moreover, Avondale has the facilities—the capacities—the special production tools required by offshore operations. For a small job—quick repair of a piece of drilling equipment—there is Avondale's enlarged Oil Field Machine Shop. For the design and construction of an elevated deck drilling barge—a big job in every sense of the word—there are Avondale's vast facilities at the River Plant. Yes, when you want the best and you want it fast, your nearest and most complete source is Avondale . . .

ability · integrity · capacity

SHIP BUILDING · SHIP REPAIRING · FOUNDERS · PROPELLERS · STRUCTURAL STEEL

AVONDALE MARINE WAYS, INC.

CABLE ADDRESS "AVONWAYS"

P. O. BOX 1030 • PHONE UNiversity 6-4561 • NEW ORLEANS 8, U. S. A.

It is now an integral part of our tax laws, and theoretical or politically inspired criticism of it should not, I am firmly convinced, sway Congress into making changes in it which can only have disruptive consequences to our economy."

Cecil Morgan, executive assistant to the chairman of the board, Standard Oil Co. (N.J.), in a speech to the Kiwanis Club of New Orleans.

Price wars can really hurt

"You cannot measure the effects of price wars in dollars and cents alone. Everybody gets hurt—even the consumer. Customers who have lived in price-war areas have seen what happened to the services they relied on for their convenience and safety. These services were taken for granted until price wars made it impossible to provide them . . .

"We have let price wars affect us in a way which is leading inevitably to marketing chaos, and possibly government regulation. In order to reverse this process, each of us must assume retail responsibility. Each of us must say what our products and services are worth. We have to establish standards that will command a fair price, and we must maintain these standards vigorously."

Dwight T. Colley, vice president, Atlantic Refining Co., chairman, American Petroleum Institute Division of Marketing, in a speech to the Empire State Petroleum Association.

Industry's time to speak

"When a man swallows poison, he can be treated with a stomach pump. But when he has taken a poisonous idea into his brain, there is no way to pump it out. He must be treated with the slow-working antidote of education. And that's what we in the oil industry have to do—a job of education. It's not a job for only one group of specialists, the public-relations people. It's a job for every oil man.

"The Bible tells us that there is a 'time to keep silence, and a time to speak.' This is surely the time for us to speak, and in a clear, emphatic voice. It is the time to set the record straight and uphold the name of our industry against the smears of its enemies.

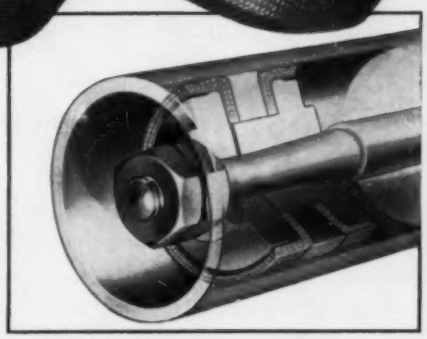
"But the industry, as such, has no voice. It can only speak through the voices of individual oil men. A militant industry, ready to speak out boldly against unfair attacks, is the best hope we have of stopping those attacks. When the propaganda mills start humming, we need only tell the truth. Those who would sap the strength of private

PUMCUP ADVANTAGES

now yours for

- **HYDRAULIC CONTROLS**
- **AIR CYLINDERS**
- **RECIPROCATING PUMPS**

Two common Pumcup types: conventional and 45° bevel type . . available in a complete range of sizes and texture-engineered compositions.



Cutaway view of typical Pumcup installation resulting in prolonged high efficiency.

TAKE it from experienced users, Darcova Pumcups offer payoff advantages that can't be equalled! For example, they last many times as long as ordinary piston packing . . and they *hold peak efficiency* from start to finish. Because of the resulting production and maintenance economies, plant after plant is standardizing on Pumcups.

Improved application of the cup principle does the trick. And Darcova Pumcups are *texture-engineered* in *a range of compositions* to meet most temperature-pressure-fluid conditions. And they are available in sizes and types exactly right for your particular equipment.

It will pay you to get *all* the facts. Just ask for Pumcup Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

TD-18 fleet readies

...on "miles from nowhere" leases!

In remote, tough-to-get-to terrain, where you can't dial for quick service, equipment has to have stay-at-work toughness—to complete rush jobs on time!

That's why Scott R. Brown, Inc., Farmington, New Mexico, depends upon a 6-unit fleet of International TD-18's—for heavy-duty power! They use these bonus-powered crawlers to speed drill-site preparation, dig mud and slush pits, buck boulders and concrete-like caliche rock to build access roads!

TD-18 has the "stay-put" features!

The TD-18's Cerametallic-faced engine clutch is immune to heat or cold—gives full-load power transfer efficiency, anytime. New full-floating seals guard TD-18 track-roller bearings through 500-hr. lube intervals. Unfailing "special delivery" engine lubrication, through rifle-drilled passages, contributes to uninterrupted TD-18 performance. New full-flow filters keep lube oil in wear-fighting trim, through 480-hr. periods.

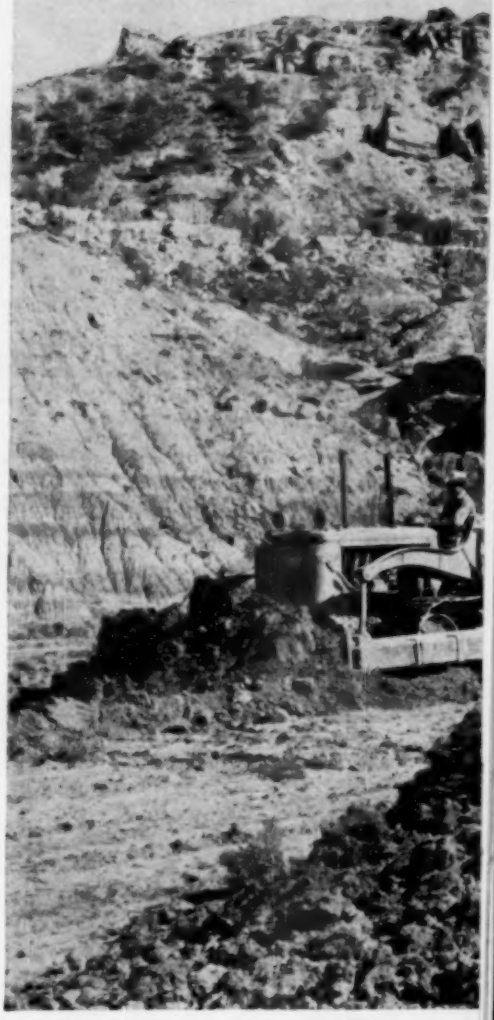
Flush-deck safety, "Control Tower" visibility, and new booster steering assure TD-18 operator comfort—and operating efficiency.

Compare job-speeding Bonus-Powered TD-18 push or pull to any other make. Compare operating and servicing ease. Compare on-the-job dependability and upkeep economy—compare distributor service. Ask your International Construction Equipment Distributor to demonstrate the TD-18—or any other size of International crawler!

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.



Two of Scott R. Brown, Inc., TD-18's—preparing a drill site near Farmington, New Mexico. States TD-18 Operator W. C. Rudd: "The TD-18 is a better oilfield crawler, all the way. Does the work faster. It's an easy machine to operate and it keeps going. This means a great deal, when working in isolated country where even a minor break-down lays you up at least a day."

Here, a Scott R. Brown, Inc. TD-18 is scarifying tough caliche rock to bulldoze a site for drilling.

rig sites fast

Easily-handled Coverlight does year 'round duty on your rigs. Its lightweight makes easy rigging up and tearing down. Mud, grime and oil stains are readily cleaned off. Coverlight is also highly resistant to aliphatics, aromatics, rot, mildew and is fire retardant. It's amazingly tough, yet when punctured, Coverlight is easily repaired on location. It's economical – provides longer life with minimum maintenance. Use Coverlight for *your* rigs. Made of tough nylon fabric with a neoprene coating, it's the *ideal* protective covering for men and machines.

Another

REEVES VULCAN
RUBBER PRODUCT

REEVES BROTHERS INC.
Vulcan Rubber Products Division
54 Worth Street, New York 13, N.Y.

LANGDON MANUFACTURING CO.
222 N. Hydraulic, Wichita, Kansas

DECKARD MANUFACTURING CO.
2601 Dawson Road, Tulsa, Oklahoma

LEWIS MANUFACTURING CO.
P. O. Box 4755, Oklahoma City, Oklahoma

enterprise with innuendo and accusation must manufacture falsehoods. If our truth can't prevail against their fabrications, then the plight of the free world and this industry is even worse than the most pessimistic of us would believe."

Frank M. Porter, president, American Petroleum Institute, in a recent speech in Los Angeles.

Business needs idea salesmen

"We businessmen have been falling down . . . in the salesmanship of ideas. Public-opinion polls again and again show up a strange combination of roaring success on one hand, and miserable failure on the other.

"These polls show that the American people like many things about business, and especially about big business, in this country. They like the quality of product that big business offers. They like the assurance of service that big business gives, and the prices that it makes possible. They like the community citizenship that big business displays.

"And yet at the same time they fear big business. They're afraid, in a vague way, of what they consider to be the power of big business. And so they tend to think there should be controls clamped on big business and some regimentation imposed on it.

"In a democracy the feelings of a people are reflected in the government quite as much as their clear thinking is. Sometimes more.

"As a result, the vague feeling of the people that maybe there's something suspect about bigness makes for real trouble. It provides a working platform for those who would like to remake our economy in the image of a planned socialism, Marxist or otherwise."

Dwight F. Benton, vice president, Standard Oil Co. (Ind.), in a speech before the Denver Chamber of Commerce.

Senator gives word of advice

"I know there are men who don't want any part of politics, and they are free to feel this way. But bear this in mind. Whether you or your industry likes it or not, there is going to be a lot of politics in your business.

"I believe there is nothing wrong or evil in the oil business and I believe that it should be represented in Congress. One fact stands out. Nobody is going to tend to your business for you."

Robert S. Kerr, U.S. Senator from Oklahoma and chairman of the board of Kerr-McGee Oil Industries, Inc., in a speech to American Association of Oilwell Drilling Contractors in Tulsa.

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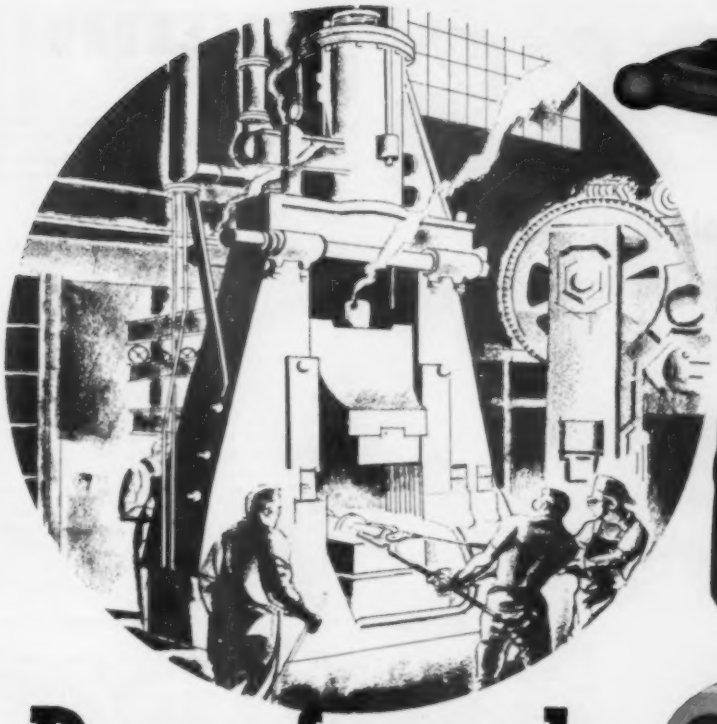

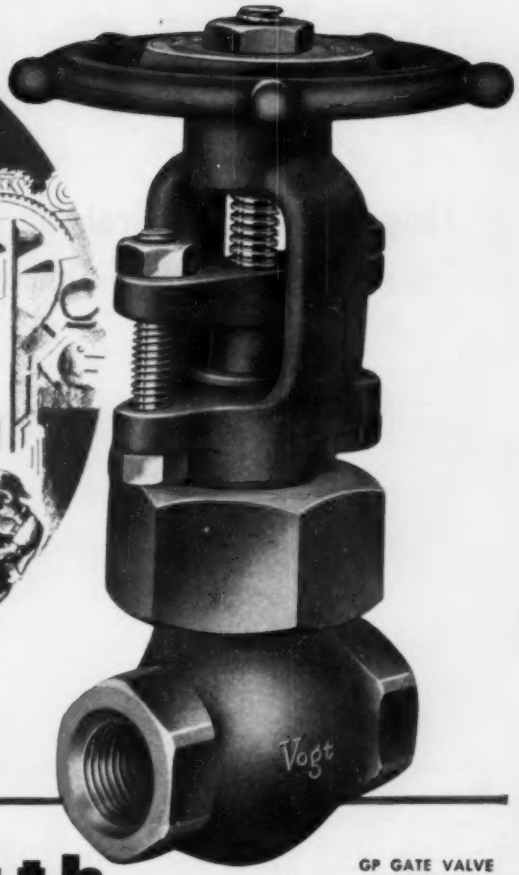

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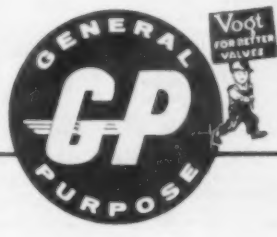

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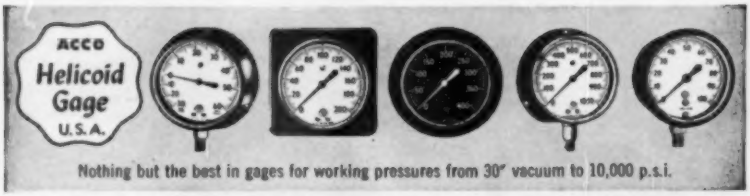

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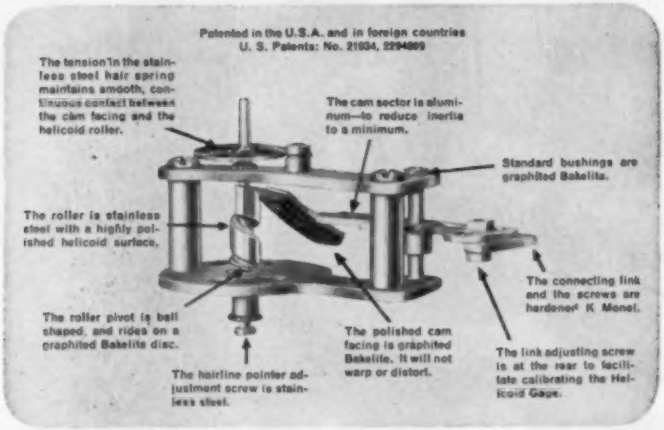
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CALENDAR

NOVEMBER

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.
6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.
7 West Central Texas Oil and Gas Association, annual technical day and membership meeting, Abilene, Tex.
7-8 American Association of Petroleum Geologists, Society of Exploration Geophysicists, Society of Economic Paleontologists and Mineralogists, Pacific sections, thirty-fourth annual meeting, Ambassador Hotel, Los Angeles.
11-14 Society of Exploration Geophysicists, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.
11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.
12-14 National Association of Corrosion Engineers, northwest region fall meeting, Penn-Sheraton Hotel, Pittsburgh.
14-15 Canadian Well Logging Society, formation evaluation symposium, Al San Club, Calgary, Alta.
14-16 Magic Plains Oil Exposition, Borger, Tex.
22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Tulsa.
1-3 Kansas Independent Oil and Gas Association, twentieth annual meeting and oil show, Broadview Hotel, Wichita, Kans.
1-6 American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York.
2-6 Twenty-sixth Exposition of Chemical Industries, Coliseum, New York.
8-11 American Institute of Chemical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.
10-11 University of Oklahoma, second annual conference on water quality control for subsurface injection, sponsored by the School of Petroleum Engineering, Extension Study Center, Norman, Okla.

JANUARY

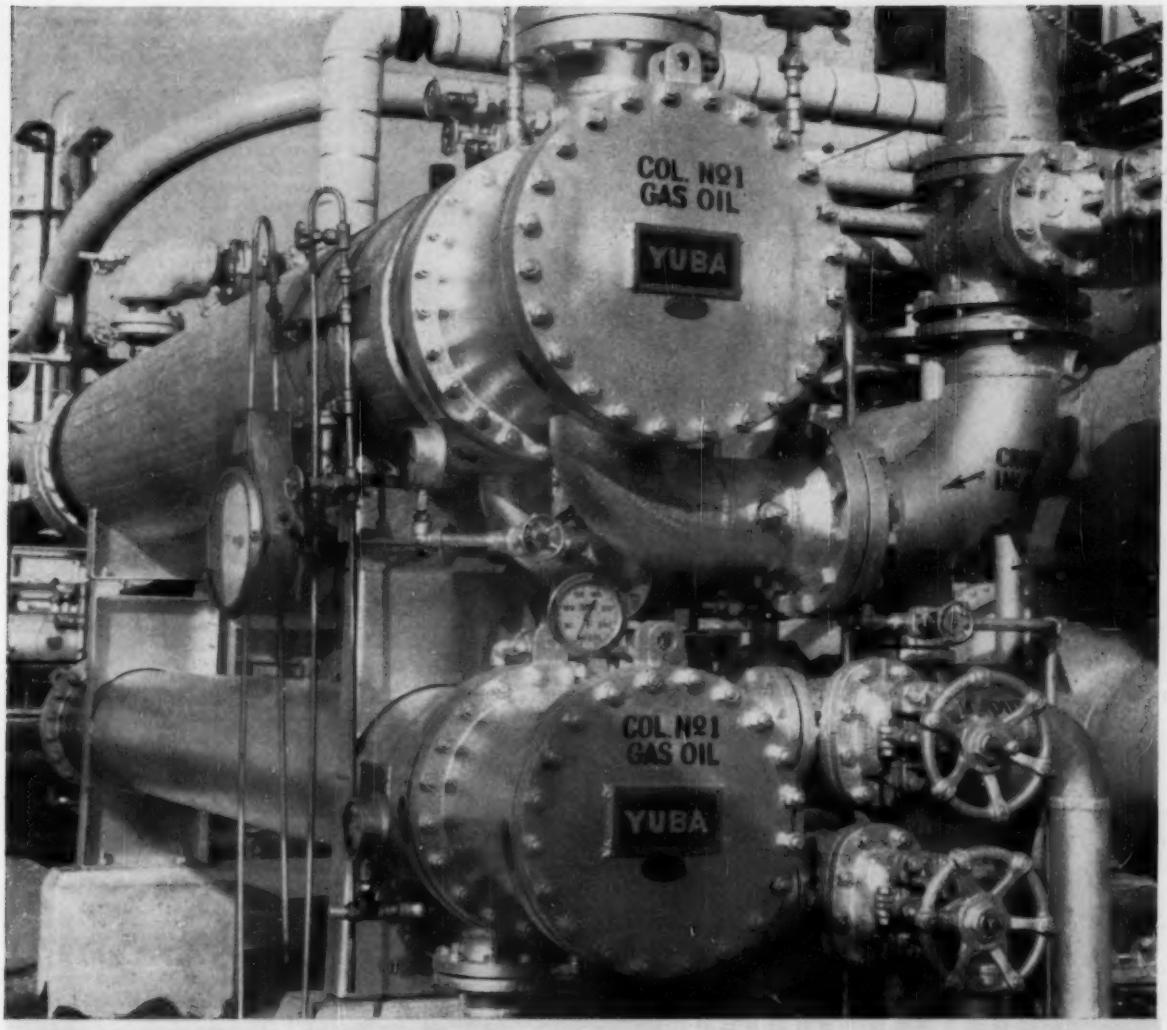
16-18 Association of Oilwell Servicing Contractors, second annual convention, Baker Hotel, Dallas.
19-22 Pipe Line Contractors Association, tenth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.
31 Natural Gasoline Association of America, regional meeting, Skirvin Hotel, Oklahoma City.

FEBRUARY

12-14 National Association of Corrosion Engineers, Tulsa section, ninth annual corrosion short course for pipeliners, Mayo Hotel, Tulsa.
15-20 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Hotel Statler, New York.
26-28 American Petroleum Institute, Division of Production, southern district meeting, Shamrock-Hilton Hotel, Houston.
28 Natural Gasoline Association of America, Permian basin regional meeting, Lincoln Hotel, Odessa, Tex.

MARCH

3-4 Society of Petroleum Engineers of American Institute of Mining, Metal-



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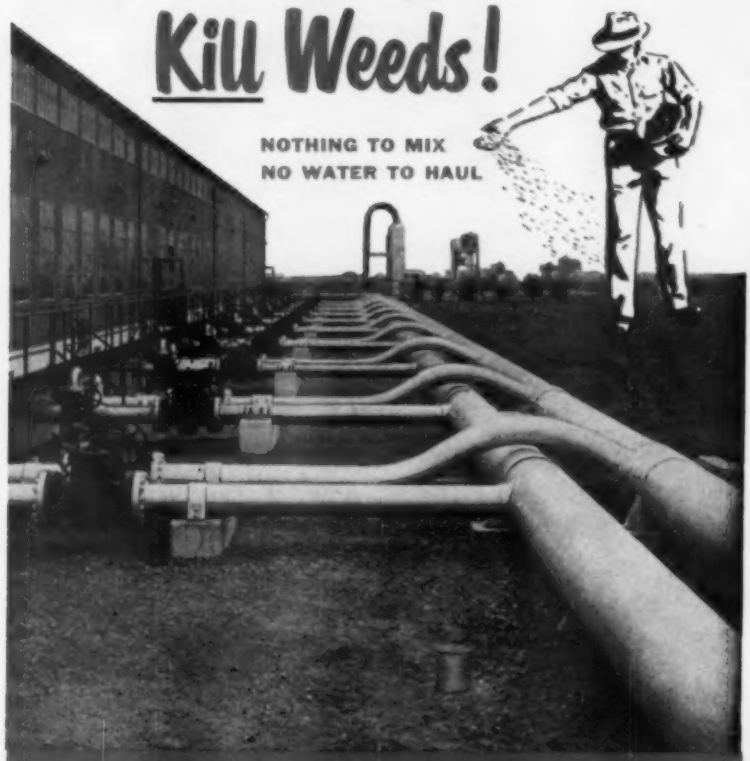

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lurgical, and Petroleum Engineers, fourth annual joint meeting of Rocky Mountain petroleum sections, Cosmopolitan Hotel, Denver.

5-6 Gas Conditioning conference, sponsored by the University of Oklahoma, Oklahoma Memorial Union Building, Norman, Okla.

7 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

12-14 American Petroleum Institute, Division of Production, southwestern district meeting, Hotel Texas, Fort Worth.

17-21 International Atomic Exposition, Inc., 1958 Nuclear Congress, Chicago Amphitheatre, Chicago.

17-21 National Association of Corrosion Engineers, annual conference, civic auditorium, San Francisco.

20-21 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, regional conference on production and reservoir engineering, Mayo Hotel, Tulsa.

24-26 Midwest Gas Association, Broadmoor Hotel, Colorado Springs, Colo.

31-April 2 American Petroleum Institute, Division of Transportation, annual pipeline conference, Jung Hotel, New Orleans.

APRIL

1-3 University of Oklahoma, fifth annual conference on corrosion control, Extension Study Center, Norman, Okla.

9-11 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Biltmore Hotel, Oklahoma City.

15-17 University of Oklahoma, thirty-fourth annual gas measurement short course, North Campus, Norman, Okla.

16-18 Natural Gasoline Association of America, annual convention, Baker and Adolphus Hotels, Dallas.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Louisiana-Arkansas, East Texas, and Mississippi petroleum sections, gas technology symposium, Shreveport, La.

20-23 American Institute of Chemical Engineers and Chemical Institute of Canada, chemical engineering division; Canada-U.S. chemical engineering conference, Montreal.

21-23 American Petro'eum Institute, Division of Production, Rocky Mountain district meeting, Cosmopolitan Hotel, Denver.

27-29 Independent Petroleum Association of America, midyear meeting, Hotel Sherman, Chicago.

27-30 American Association of Petroleum Geologists, annual convention, Casper, Wyo.

28-29 University of Oklahoma, third annual conference on automatic control in the petroleum and chemical industries, Oklahoma Memorial Union Building, Norman, Okla.

MAY

5-6 Society of Petroleum Engineers of A.I.M.E., North Texas section, secondary-recovery symposium, Wichita Falls, Tex.

12-16 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, Los Angeles.

21-23 American Petroleum Institute, Division of Marketing, midyear meeting, Roosevelt Hotel, New Orleans.

22-23 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

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In 1956, using a total of 26 Failing drills, the Failing Exploration and Drilling Company set a record of . . .

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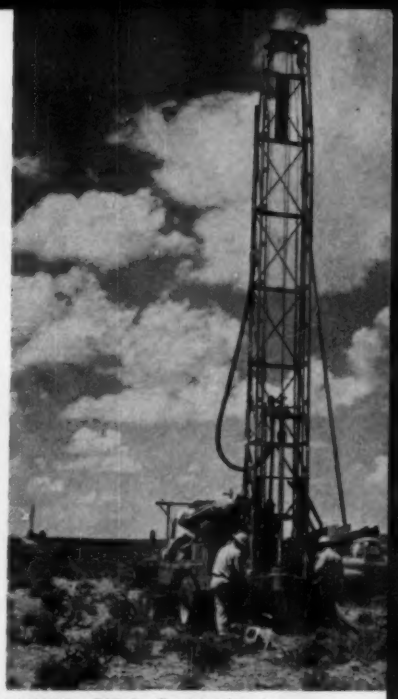
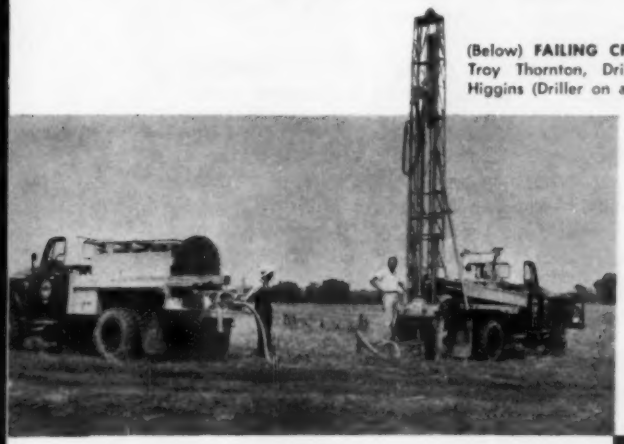


FAILING CFD-1 Combination in Northwest New Mexico, manned by Richard E. Womble, Driller . . . and Frankie L. Davis, Helper.

TWEED FAILING, owner of Failing Exploration and Drilling Company, Houston, Texas.



(Below) **FAILING CFD-2 DRILL** in East Texas, with Troy Thornton, Driller, at controls . . . and J. P. Higgins (Driller on a CFD-2) assisting.

1956 PRODUCTION RECORDS

Set by Failing Exploration and Drilling Co. of Houston, Texas

Failing Model CFD-1, water rigs:
San Juan Basin, Northwest New Mexico — 99.2 feet per hour of field operations for a 12-month period.

South Central Texas — 104.8 feet per hour of field operations for a 10-month period.

Failing Model CFD-1, Combination rig:
San Juan Basin, Northwest New Mexico — 118.7 feet per hour of field operations for a 10-month period.

Failing Model CFD-2:
East Texas — 100.1 feet per hour of field operations for a 12-month period.

FAILING RIGS currently in service at the Failing Exploration and Drilling Co. of Houston, Texas:

5	Failing Model 1500
5	Failing Model CFD-1, water
3	Failing Model CFD-1, Combination
13	Failing Model CFD-2
26	TOTAL

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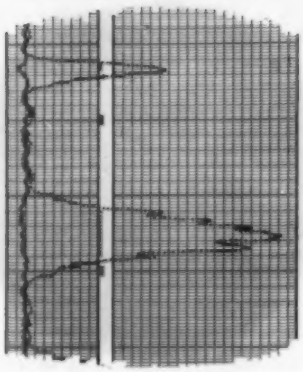

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JOURNALLY SPEAKING

Wasted Effort

SOMETIMES WE WONDER why we bother to print all the stuff we cram into the Big Yellow Book every week. Every now and then we get evidence to indicate that it's just wasted effort.

Here we are, scratching and slaving and tearing our hearts out to educate oil men in the various sciences that can contribute to their success and to keep them informed on the very latest technological developments pertaining to their occupation.

So what happens? So we hear an incident like this:

Aurora Gasoline Co. conducted an extensive and expensive geological campaign in southern Michigan. It mustered all the scientific data it could find in its search for oil. It leased a big block of acreage and laborously pondered the best places to start drilling.

Then a farmer, who had refused to lease his place to Aurora, consulted a fortune teller. Did the fortune teller consult The Oil and Gas Journal? He never even heard of it. He consulted his crystal ball, astrology chart, and dream book, and told the farmer he would find a big oil field under his south forty.

The farmer drilled a well himself without the benefit of any of the modern techniques which our favorite oil publication reports so faithfully. He brought in a big discovery well in a deep Trenton zone (and all the time the farmer thought Trenton was in New Jersey).

Aurora hurried to drill an offset, but in spite of all scientific precautions the well blew out (OGJ, Sept. 23, p. 78). The blowout caused Aurora no end of trouble, but the incident caused it no end of chagrin.

"Fire the geologists," the production superintendent recommended, "and hire that fortune teller."

Things like that are so discouraging.

But as if that weren't enough, our gloom is deepened by a letter from a professor of geology in a petroleum-engineering school. He uses the Big Yellow Book as a textbook (very intelligent man) and makes all his students subscribe (our circulation manager loves him).

Required reading for the class is the Journal's exploration section. Every week the professor gives a test on it. A sample question:

"North of the Wichita Mountain front, the Springer formation has been revived as an oil producer. Production is from a ——— trap against the basal ——— unconformity. The Springer was laid down, then disturbed by the ——— Mountain orogeny, then buried by later ——— deposition. It was during the ——— Mountain orogeny that truncation of the Springer beds took place. The traps are confined to the flanks of a large closed ———."

All the answers were in the previous week's Journal. But the professor writes:

"The results were not so good. Out of 30 students, only 1 got into the 80's, 6 in the 70's, with the remainder below 69." Then he added a comment so sage and significant that we're going to have our composing room set it in caps:

"MOST OF THEIR TROUBLE WAS NOT READING THE JOURNAL THOROUGHLY."

Is that your trouble too? Do you read and believe everything that we print? Or are you, like Aurora Gasoline Co., of a mind to chuck it all and hire a fortune teller?

However, futile as it sometimes seems, we intend to keep right on trying to tell oil men how to find oil by scientific methods.

For instance, in this week's book we have three special articles on the subject.

One of them tells what can be done with an airborne magnetometer (the oil man's Sputnik). Another tells how to use a seismograph in the Delaware basin (that's the one in Texas, not the one between Pennsylvania and New Jersey). The third tells where oil is on the Gulf Coast (with a whole flock of beautiful maps.)

Though we haven't consulted a fortune teller about it, we are firmly of the opinion that if oil men will read such pieces thoroughly enough to get more than 69 on an examination they will be helped in finding oil.

If not, maybe it's all wasted effort.

—*Henry D. Ralph.*

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The last word on oil imports

TWO official spokesmen last week made it unmistakably clear that the administration's policy on oil imports is irrevocably set. Dissatisfied groups within the industry and outside of it may as well be reconciled to it.

There was little new in what Herbert Hoover and Captain Carson told the I.P.A.A. The significance of their speeches is that they left no room for argument or revision. These basic policies are firm:

- Large and unlimited oil imports are a threat to national defense, endanger the health of the domestic producing industry, and are against the long-range interests of consumers.
- Foreign oil should not be excluded, but imports should maintain a reasonable balance with domestic production.
- Neither tariffs nor country quotas are acceptable methods of obtaining the desired results.
- The presently set goal for imports east of the Rockies is approximately the proper level.
- The present method of assigning import allotments to individual refiners is the most practical administrative machinery, and while it imposes hardships on some it is less unfair than any other formula.
- Public and private pressure will be used to get voluntary compliance—and compliance is expected.
- Mandatory control is abhorrent and will be used only as a last resort. But if imposed it will be to enforce the present formula.
- Imports of refined products, and of crude to the West Coast, will be put under a similar system if conditions warrant.
- Applications from new importers will be considered on their individual merits. But any substantial increase in total imports must await a corresponding increase in U. S. demand.
- The present program is flexible. Patience and reasonableness are being used in its application and are expected from its participants and its critics.
- The program is working about as well as could be expected, and should get even better results next year.

SUCH STATEMENTS serve notice to all concerned that the administration is not in a mood for tinkering with its imports program, not responsive to suggestions for change. It is committed to its course.

This is a tip that when the Reciprocal Trade Agreements Act comes up for renewal by Congress next year the administration will fight any amendments which would upset its method of dealing with oil imports.

In other words, Hoover and Carson seemed to be saying, "This is it, boys. And you may as well get adjusted to it because it's going to be like this for quite some time."

Dewitt Lacy, senior observer, with 16 years' experience in seismic exploration, knows how to get the most from every recording made.

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the OIL AND GAS JOURNAL

November 4, 1957

Urban projects like this Dallas loop are more common now, but . . .

Changes Due in Highway Program

- The oil industry stands to lose regardless of what is done. If the 41,000-mile system is cut down, oil will lose a market for asphalt. If the system is maintained, a special 1-cent federal gasoline tax will probably be extended. This could lead to a cut in gasoline sales.

THE FEDERAL highway building program in which the oil industry has a major stake will face its first real crisis when Congress reconvenes early in January.

With only 13.3 miles of a projected 41,000 miles of road work completed, the program has money troubles.

Original appropriation for the interstate system was $24,825,000,000. Taxes earmarked for the work were expected to produce $25,135,000,000. But both figures now are believed far less than the ultimate cost.

What happened? Bertram D. Tallamy, federal highway administrator, is expected to tell Congress this:

. . . **Costs have risen.** The price of materials and labor destined for the interstate roads all have increased since the program was authorized in 1956. This is expected to jump costs by about 4 to 5 per cent more.

. . . **Degree of state participation** has changed. The 1956 act was based on a 1954 survey made on the theory that states and federal Government would share costs on a 50-50 basis. The estimate was that 41,000 miles of highway could be built at a cost to the federal Government of $24.8 billion.

But the ratio finally adopted for the interstate system called for the federal Government to foot 90 per cent of the cost. This jumped ultimate federal costs.

What to do . . . Just how much more money will be needed is not known.

Best guesses range from 30 per cent to as much as 100 per cent more to buy the 41,000-mile system. One thing is clear: Added costs will mean a radical change in the program as it stands now.

Three courses appear open for an economy-minded administration and an economy-minded Congress:

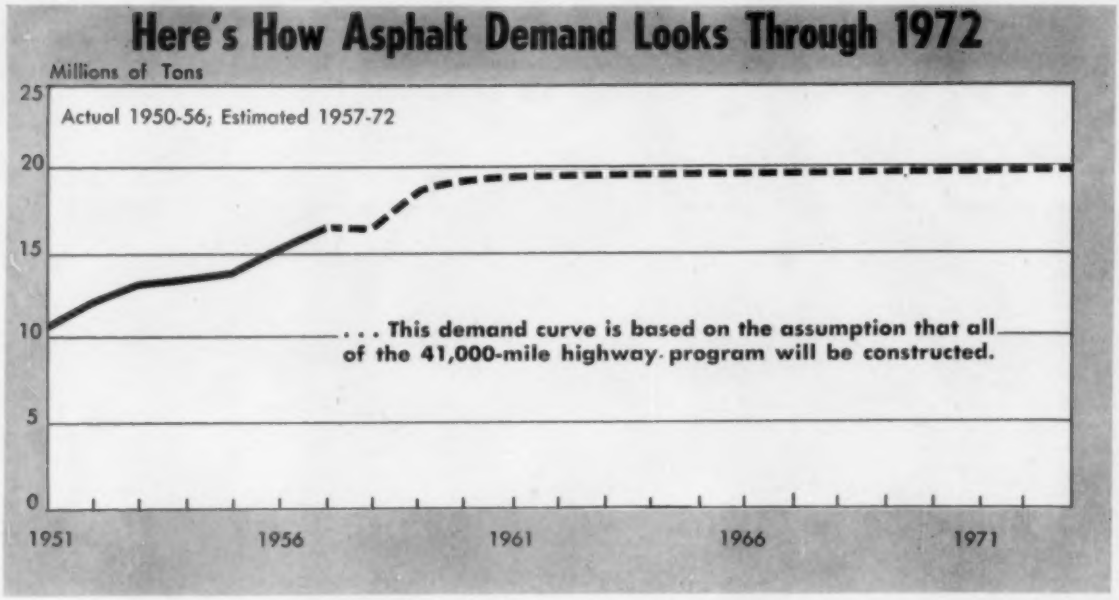
. . . **Keep the present program** and find additional funds.

Since the interstate program is being financed largely by a special 1-cent federal gasoline tax among other sources, this likely would mean another increase in that tax.

. . . **Cut the program** to stay within revenue produced by the present tax.

This would mean eliminating part of the work and reducing the anticipated benefits to the public and to the oil industry.

. . . **Stretch out the program** and



finance it with the present tax.

This would add at least 5 to 10 years to life of the work. It also would extend life of the special tax by at least 5 and possibly 15 years. The tax is now scheduled to expire June 30, 1972.

Oil's stake . . . Any of these alternatives is a real concern to the oil industry.

When hearings were held on the program in 1956, industry spokesmen opposed the added tax on gasoline. They argued that highways benefit, everyone—nonusers as well as users. For that reason they felt the historic pattern of paying federal highway contributions out of the general fund should be continued.

Any plan now to increase or prolong the extra gasoline tax would be even more repugnant to oil men. Demand for motor fuel has not lived up to expectations this year, and the industry can be expected to oppose any new burden that would tend to depress this demand further.

Oil men, on the other hand, also have a special interest in seeing that the full interstate system is realized. In recent years motorists have averaged fewer miles per vehicle each year. Some observers blame this trend on congested highways. Others say it's the higher cost of motoring. Oil men naturally would like to see this trend reversed. More motoring would mean more service-station business.

But here's the dilemma on that point: Better highways would contribute to increased motoring and higher gasoline sales, but higher taxes would tend to restrict use of gasoline.

The oil industry also will share in direct benefits while construction is going on. When the program is in full swing, the road work is expected to require 10,180,000 tons of asphalt per year. This is nearly two-thirds of last year's demand for this petroleum product. It would be a healthy market boon to asphalt producers.

Asphalt isn't the only petroleum product due to get a lift from the construction. Fuels and lubricants needed in the highway work at its peak will amount to about 75,000 bbl. daily.

What roads mean . . . Chief benefit from the program, however, would be this: It will give more running room to the nation's ever-increasing fleet of vehicles.

The Bureau of Public Roads estimates there are 67,204,000 registered private motor vehicles in the U. S. this year. This is an increase of 2,000,000 from 1956. It also is a 40 per cent gain in 7 years because back in 1950 private vehicles only totaled 48,566,984.

While this tremendous increase in vehicles was occurring, there was only a small increase in mileage of highways in the nation. Economists feel sure the new highway system will stimulate motoring. For instance the interstate system will:

. . . **Carry 20 per cent** of the nation's nonurban traffic.

. . . **Reach 90 per cent** of cities having a population of 50,000 or more.

. . . **Connect 42 of the 48 state capitals.**

At least 80 per cent of the system would be four or six-lane divided highways. And at least 75 per cent of it will be brand new roads, not just reconstructed old ones.

That's the ultimate picture of the system. It's far from that today, however. The program is nearly a year and one-half old but only 13.3 miles of road work have been completed.

Why the lag . . . Superficially it appears the highway program is off to a slow start. Actually it is not.

The period between conception of a highway project and its execution—called leadtime—traditionally is long. The American Road Builders Association reports that "current practice on federal aid projects discloses that an average of 21 months of leadtime elapses from the date funds are authorized to the beginning of construction."

The September report of the Bureau of Public Roads shows that some states are lagging badly in preparing the new program. Most glaring of these is Indiana with only 4.1 miles planned. Texas is far out in front with 408 miles Other leaders are North Carolina with 282.5; Kansas, 198.3; Iowa, 169.4, and Arizona, 168.6. Altogether 3,691.2 miles of the 41,000 total are at least programed. This work will cost $2,932,-487,000.

About two-thirds of the 3,691.2 miles is well along in planning. The remainder is only in the preliminary stages. The relatively small amount of work that already is well under way represents projects on which preliminaries were out of the way before the interstate program began.

Much of the interstate planning did

THE HIGHWAY TRUST FUND

. . . The interstate highway construction program will be financed by this trust fund, which was set up in 1956. Here's how the fund looks based on extending the construction program from 1969 to 1972.

(In millions of dollars)

Fiscal Year	Receipts	Interstate System	Prim., secondary, and urban systems*	Total	Notes
1957	1,542	300	750	1,050	
1958	2,070	1,100	800	1,900	
1959	2,118	1,500	850	2,350	
1960	2,159	1,600	900	2,500	
1961	2,206	1,395	900	2,295	
1962	2,258	1,358	900	2,258	
1963	2,313	1,413	900	2,313	
1964	2,370	1,470	900	2,370	
1965	2,429	1,529	900	2,429	
1966	2,490	1,590	900	2,490	
1967	2,553	1,653	900	2,553	
1968	2,619	1,719	900	2,619	
1969	2,686	1,786	900	2,686	
1970	2,755	1,855	900	2,755	
1971	2,826	1,926	900	2,826	
1972	3,139†	2,941	198	3,139	
Total	38,533	25,135	13,398	38,533	

*Assuming primary, secondary, and urban authorizations totalling $900 million annually, fiscal years 1960 to 1970, inclusive.

†Includes receipts and refunds after June 30, 1972, of taxes and refunds accrued on or before that date.

Source: Office of the Secretary of the Treasury, Analysis Staff, Tax Division, Feb. 28, 1957.

not start until after the act was passed in mid-1956. Since a leadtime of 21 months must be allowed, this means the program cannot get into full swing until after March 1958.

This accounts for the delay in the expected upswing in asphalt demand. Refiners can expect this to be felt now some time in 1958 and to reach a peak a year or more later. However, this development does not alter the original estimates of the quantity of asphalt which will be needed.

Once actual construction gets into high gear, these demands will be both appreciable and sustained. Orginally the interstate program was set up on a 13-year basis, 1957 to 1969, inclusive. It was slowed down and drawn out by the Byrd amendment This amendment will add at least 2 years and probably more.

Under it, no federal funds can be doled out to states in excess of the total expected to be in the Highway Trust Fund. (See Table 1.) This fund was set up to receive all revenues from taxes assessed for highway improvement. They apply not only to the 41,000-mile interstate system but also to primary and secondary systems and their urban extensions.

The primary and secondary systems were part of the federal-aid program before the interstate program was conceived. Therefore, these primary and secondary roads take priority. Money for the interstate system then is what remains after the others have been taken care of.

This highway fund is administered by the Treasury. Fiscal experts say that total receipts in the 16 years from 1957 to 1972 will be $38,533,000,000. Committments to the primary and secondary systems for this period are $13,398,000,000. This leaves $25,135,000,000 for the interstate system.

This would have been plenty for the interstate systems as originally conceived. It now will be far less than enough as Tallamy is expected to tell Congress some time after January 1.

The Bureau of Public Roads has three methods for dividing these funds. One applies to primary and secondary systems, another to urban highways not on the interstate system, and the third to the interstate program. The first two are financed approximately on a 50-50 federal-state basis. The interstate projects receive funds on a 90-10 basis.

Funds for primary and secondary systems are apportioned in this way: One-third is based on the ratio of a state's area to the total area of the U. S., one-third on the ratio of its population to U. S. population, and one-third on the ratio of its rural mail delivery and star routes to the U. S. total of such roads.

In the case of urban highways, the apportionment is based on the ratio of a community's population to total urban population of the country.

Currently and until 1959, interstate highway funds are divided according to the same factors, but they are weighted differently. Population counts for two-thirds, and area and post-road mileage, each one-sixth. After 1959, federal funds will be doled out on the ratio of the cost of completing the system in one state to the cost of the system as a whole. It is the intent of the act to complete all sections simultaneously.

Good Faith Revived

● Supreme Court ready to hear new arguments on price-cutting issue

WASHINGTON. — The Supreme Court last week readied itself to pass on the "good faith" price-cutting issue for the second time.

The way for argument next week was cleared with the submission of briefs by Standard Oil Co. (Ind.) and two large jobber associations which are supporting the company's position.

Standard asked the court to reaffirm the stand it took in 1951. It held then that the cutting of prices to selected customers in good faith to meet competition did not violate the Robinson-Patman Antiprice Discrimination Law.

The 17-year-old controversy centers on charges by the Federal Trade Commission that Standard violated the Robinson-Patman Act when it cut its prices to four customers in the Detroit area to meet competition. The FTC held that its lower prices should have applied to all its customers equally.

Case appealed . . . The case reached the high court for the second time on an appeal by the Government for a 1956 decision of the Chicago federal Circuit Court. That court threw out a revised order written by the FTC, to comply with the 1951 Supreme Court opinion.

The Chicago court rejected the FTC's argument that the price cuts were not made in good faith but under "an industry-wide, perhaps collusive, scheme."

Standard contended in its brief that the cuts were aimed solely at meeting competition. It said they could be justified on the basis of storage and other services performed by the favored customers.

The company asked the Supreme Court to ignore the pricing issue. It charged that the FTC had thrown it in as an "afterthought." The wide variety of prices quoted by competing oil companies at the time of the alleged offense shows there was no industry "system," it said.

The National Oil Jobbers Council and Empire State Petroleum Association briefs asserted that if the FTC wins the case it will not hurt Standard of Indiana but will have an adverse impact on the independent oil jobbers.

Canadians Gain Control

...of Trans-Canada Pipe Line. Sale of stock by T.G.T. and Hudson's Bay puts American ownership in minority

CALGARY. — The ownership of Trans-Canada Pipe Lines, Ltd., has changed sharply, and the new lineup realizes a dream cherished by proud Canadians.

The sale of its stock by Tennessee Gas Transmission Co. and Hudson's Bay Oil & Gas Co., two American-controlled firms who had major interests in Trans-Canada, leaves this picture:

... **Home Oil Co., Ltd.,** a Canadian company, is the largest single owner in the $378-million gas line being built from Alberta to Montreal. It holds 702,427 shares worth $14 million.

... **Canadians** for the first time hold the majority of common stock. This fact will help scotch charges that foreign interests dominate a project which has become a national symbol of Canada's new-found natural-gas wealth.

The stock sale preceded the creation of a royal commission to investigate Trans-Canada operations and other national energy problems. There was no connection between the events. Both Tennessee and Hudson's Bay, owned 75 per cent by Continental Oil Co., explained that they took an interest in Trans-Canada in the first place to get the floundering project off the ground. Now that it's a going concern, there's no longer a need for their backing.

The disposal of Tennessee and Hudson's Bay stock, which took place over a period of several weeks, resulted in this new ownership lineup:

... **Home Oil,** 12 per cent.

... **Canadian Delhi** Oil, Ltd., 8 per cent.

... **British American** Oil Co., Ltd., 5 per cent.

The rest of the stock is held by the public. When the 3,750,000 shares were offered to the public early this year, they were snapped up by 35,000 Canadians and 6,000 Americans. It's reported that Canadians bought 78 per cent of the shares. Before the public offering, when the sponsors disposed of 51 per cent of their holdings, stock ownership was Canadian Delhi 24½ per cent, Western Pipe Lines (Canadian) 24½ per cent, Canadian Gulf (British American) 17 per cent, Hudson's Bay 17 per cent, and Tennessee Gas 17 per cent.

Although two of the remaining three principal owners are American, they gave no indication they are inclined to sell their stock. Canadian Delhi, a Clint Murchison firm and originator of the project, said it hadn't sold any stock. There were reports, however, it had been approached by a prospective buyer. British American, like Hudson's Bay and Canadian Delhi, is a large supplier of gas to Trans-Canada and got behind the project for that reason.

Effect of new ownership ... The new ownership will be reflected on the board of directors, probably at a meeting in Toronto Thursday.

R. A. Brown, president of Home Oil, will be represented on the board instead of Tennessee. R. C. Brown, president of Hudson's Bay, left the board 3 months ago.

Although Tennessee is out of the picture, Charles S. Coates, former senior vice president of Tennessee, is expected to continue as president. He was hired as executive vice president before Tennessee bought into Trans-Canada.

The entire Trans-Canada board is high on Coates because of the way he got the project rolling. In spite of money problems, steel shortages, politics, and the short Canadian construction season, the line will be 60 per cent in the ground by the end of this year. It will be complete from Alberta to Montreal by November 1958. The line is now delivering gas to Winnipeg and other cities between there and Alberta. The entire 2,500-mile line is either in the ground, under construction, or up for bid.

Investment for Home ... Home is not interested in changing the Trans-Canada management.

Its purchase was strictly an investment. It's a means to participate in the growth of a project which Brown and others consider to have tremendous future potential.

Trans-Canada's original design capacity, when all stations have been built, is 780,000,000 cu. ft. per day. Officials expect market growth to warrant a move to double capacity within 5 years.

Tennessee still has a contract to purchase gas from Trans-Canada at Emerson, Man., for delivery to Upper Midwest markets. Hearings on this hotly contested proposal are now before the Federal Power Commission. Tennessee also plans to import gas from Trans-Canada into New York.

More gas for steam generation:

California Utilities Make Pact

LOS ANGELES.—A major feud simmered down in southern California when gas distributors made a long-term agreement to supply gas to steam-generating plants.

The deal, if approved by the California Public Utilities Commission next month, would bring in more natural gas for power generation at the expense of fuel oil.

Two major, but widely separated, effects of the pact would be: Importation of more Texas and Rocky Mountain gas and compliance with a request from southern California antismog officials to switch from fuel oil to gas in steam-electric generation.

The new pact between Southern California Edison Co. on one hand and Southern California Gas Co. and Southern Counties Gas Co. on the other hand, include these main points:

... **A semifirm priority system** for all steam-generating plants in southern California.

... **Abandonment of a proposed** 130-mile gas line from the San Joaquin Valley to Los Angeles, originally proposed by Edison.

... **Contracts between Edison** and Richfield Oil Corp. and between Edison and El Paso Natural Gas Co. will be taken over by the two gas distributors. The latter contract called for delivery of 50,000 to 300,000 M.c.f. of gas daily over an 18-year period.

What's involved ... The two gas distributors will start immediate delivery of a minimum of 20,000 M.c.f. daily to Edison generating plants. This will be stepped up to 100,000 M.c.f. daily in about 15 years.

Total gas called for is 400,000,000 M.c.f. to be provided the Edison firm in exchange for the Richfield contract. Under the new agreement the two gas firms will be able to take an additional 80,000 M.c.f. daily from Richfield for peaking purposes.

The new agreement also calls for a semifirm basis delivery of at least 50 per cent of the contract volume. Deliveries will be made at all times, except when the gas firms must curtail to meet firm customer demand—mostly residential.

At present, steam-generating plants and cement plants constitute 60 per cent of the gas companies' interruptible load. Gas consumed in electric generation last year amounted to about 40 per cent of the total requirement. Fuel-oil consumption amounted to 60 per cent.

Besides the antismog campaign, the comparative prices between fuel oil and natural gas also played a part in influencing Edison's decision to switch to gas as much as possible.

Residual fuel is no longer the bargain it once was on the West Coast. In the past year alone, the price on fuel oil has risen from $2.15 per barrel to $2.85.

Pipeline . . . In announcing abandonment of plans to build the 130-mile gas line, the Edison company removed a major thorn in the side of the gas companies. It was this line that touched off a bitter dispute between the utilities last summer (OGJ, July 8, p. 80).

Edison has already spent several million dollars on pipe and rights-of-way. Now that plans are junked, Edison will peddle the 20-in. and 30-in. pipe if the deal is approved by the state utilities commission.

Residual Check Due

ODM asks importers to submit monthly reports

WASHINGTON. — The Government has ordered a check on residual fuel imports to guard against their use to evade controls on foreign crude oil.

Forms similar to those used for crude oil will soon go to residual importers, who will be required to file monthly reports of actual receipts and future schedules.

Complaints that residual imports are already excessive have been filed by coal interests "and others," Mobilization Director Gordon Gray says.

If reports bear this out, the ODM will consider whether the national-security clause of the Reciprocal Trade Act should be revoked. More likely, however, the importers will be asked to make voluntary cuts, along the line of the crude control program.

Prior to the closing of the Suez Canal last year, former Director Arthur S. Flemming called for periodic reports on oil imports. But residual was not pinpointed as sharply as is now planned, Gray said.

No call for similar reports on other refined products is planned at this time.

watching WASHINGTON

. . . with Bertram F. Linz

Lawmakers get their dander up . . .

"INDUSTRY self-regulation" is getting to be a dirty term in Washington, especially when applied to oil.

Congressmen investigating the industry have heard a lot about self-regulation. They are beginning to show resentment over the implication that the Government is only a back-seat driver.

Rep. Emanuel Celler of New York lashed out at the phrase during his hearings on consent-decree compliance. He said it suggests that industry overawes Congress and the federal agencies and makes them surrender their power of regulation.

Celler made it clear that Congress still writes the laws, and the agencies enforce them. He agreed it is proper that industry should cooperate with the agencies in writing just and reasonable regulations. But he insisted that the regulation itself rests with the Government.

A better term for this industry-government effort would be "cooperative regulation," Celler suggested.

Wanted: More inventions . . .

IF SOME refiner can bring in a multiviscosity lube oil effective from —65° below to +125° F., the Armed Forces will give him a king-size welcome.

This is one of 387 inventions urgently wanted by the military. Added to lists previously compiled, nearly 900 scientific problems have been posed for the nation's industries to work on.

There are a number of projects for refiners. The military could use a fluorine-resistant lubricant as well as lubricants which would be effective at temperatures as high as 1,000° C. Also wanted is a gelling agent which will form gels of firm consistency capable of long-term storage under operational conditions.

Equipment manufacturers can get into the game. They are invited to come up with a strong, lightweight coupling for pipe up to 8 in. in diameter for gasoline lines operating at 800 psi.

The Government also is looking for a new means of assembling gasoline-tight steel tanks other than with bolts.

Officials hope technicians in the oil industry already may have solutions to some of these problems. If so, the National Inventors Council in Washington, would like to hear from them.

GOP is a trust-buster, too . . .

THE Eisenhower administration is proving that the Republicans are just as antitrust-minded as the Democrats.

Businessmen who dreamed in 1953 that the new administration would play footsies with "big business" quickly found it wasn't going to be that way.

The fact is that in its first 4 years the Republican Justice Department filed 182 antitrust suits. The Democratic-controlled department, in its last 4 years, filed 185 cases.

The big difference is that more stress now is being laid on oil. One-fourth of the lawyers in the antitrust division devote themselves to oil.

Oil is a natural for trust-busters. Since the formerly integrated film industry was split, oil is the one business in which the leading companies produce the raw material and make the goods they sell the consumer through their own outlets or retailers tied to them. That setup creates more situations where the Government can step in.

And there will be no let-up in the antimonopoly drive under William P. Rogers, now succeeding Herbert Brownell, Jr., as attorney general. The pattern is too firmly set and Congress too watchful.

This overflow crowd turned out for an open meeting of the imports-policy committee.

I.P.A.A. Again Endorses Imports Plan

● Action follows talks by Hoover and Carson, with a strong assist from Rathbone. Association also decides to give wholehearted support to gas bill

DALLAS.—Unqualified support of the administration's program to control oil imports was voted by the Independent Petroleum Association of America at its twenty-eighth meeting here last week.

The resolution to "commend and enthusiastically support" the program came from the imports-policy committee after the association had heard explanations of the administration policy from Capt. M. V. Carson, Jr. the program's administrator, and from Herbert Hoover, Jr., one of its principal architects.

The independents' enthusiasm was heightened by a strong plug for the program made by M. J. Rathbone, president of Standard Oil Co. (N. J.). "There is no doubt that crude-oil imports into this country reached too high a level.

"I think it is unfortunate that imports reached such a level. As a result, our government stepped into the picture and provided guidance to each company in its import program. Happily, and wisely, this did not take the form of government control.

"I regard this as a sign of confidence that each importing company will recognize the importance of this problem and act accordingly. But I think it is quite clear that no one can expect to continue to enjoy this confidence unless the problem is handled in a manner consistent with the guides suggested by the government."

Rathbone warned producers and importers alike that if the voluntary program fails the industry will be saddled with government controls which will reach into every activity of the industry.

Both Hoover and Carson reviewed the history of the imports program and explained why the administration rejected various other plans and adopted the present formula of allocations to individual importers. They stated emphatically that the administration is committed to approximately the current level of imports and the allocation formula. They both promised that the program will be administered in a flexible but firm manner and will be enforced by whatever means may be necessary.

Gas action . . . The I.P.A.A. adopted a resolution urging each of its members to "actively, enthusiastically, and wholeheartedly" support the enactment of the pending Harris-O'Hara bill.

This action came after the meeting heard speeches both for and against the bill.

Charlton H. Lyons, president of the Mid-Continent Oil and Gas Association vigorously defended the bill in its present form, insisting that it is not only the only form of legislation likely to be adopted by Congress but is also an excellent bill from the standpoint of gas producers and is vital to the future of producers and of the industry as a whole.

The opposition speaker was Tom Pickett, executive vice president of the National Coal Association. His opposition was not to what the bill does but to what it doesn't do. He said coal interests will fight the bill unless it is extended to an entirely new subject—industrial sales by interstate pipelines.

Pickett insisted that present law permits pipelines to sell gas to industries at less than cost, thereby using unfair competition to displace coal. Coal interests want the bill to cover this subject and give the Federal Power Commission authority to regulate such sales and prohibit industrial sales of gas at less than cost.

More research urged . . . Rathbone's answer to the problem of rising costs is a big research program to find ways of discovering and producing oil more economically. The bulk of his address was on this subject.

He urged independent producers to join majors in "bold, imaginative,

and freshly creative research methods" to open new frontiers of technical knowledge.

The industry has an obligation to its customers to keep oil prices low, he said, and the only alternative is to reduce its costs in order to assure that the industry's profit margin and cash generation will be sufficient to provide incentive and the capital needed to find and produce future supplies.

If new geological and geophysical methods could reduce the number of dry holes by 10 per cent, Rathbone said, it would save the industry at least $130,000,000 a year.

He urged widespread adoption of automatic lease transfer systems to reduce manpower, tankage, and equipment costs; improvements in lifting methods, workovers, and completion techniques; and more intensive study of secondary-recovery methods.

Development of new drilling methods to cut penetration costs should not be left to drilling contractors and equipment manufacturers, Rathbone insisted, because it is the producers who really benefit from cheaper drilling. But he pointed out that this year the industry is spending less than $5,000,000 on drilling research, or less than one-tenth of one per cent of its expenditures.

Fewer wells? . . . The greatest handicap of the domestic industry in competing with foreign oil is the U. S. practice of drilling too many wells, Rathbone declared.

Wider spacing and cooperative development of reservoirs as a unit would bring a great reduction in costs, he insisted, adding:

"Last year in the State of Texas, for example, 13,082 wells were completed. Had we doubled our well spacing, we might have reduced expenditures by some $36,000,000 and saved an additional $10,000,000 per year in operating costs. This total would have been equivalent to 35 cents for each barrel of crude oil produced in Texas last year."

Unless the industry can keep its costs down it will feel severe pressure from other forms of energy, the laws of economics, or some other outside force, Rathbone declared, saying that intensified research is not just a social obligation but a matter of sheer necessity. He said that currently about $40,000,000 per year is being spent in all phases of exploration and production research, or less than one-half of 1 per cent of all the industry's expenditures, whereas in many other technical industries research expenditures of 2 to 5 per cent are common.

Tax analysis . . . To destroy the dangerous myth that oil producers enjoy preferential tax treatment at the expense of other taxpayers, the industry must create a better public understanding of the peculiar risks and problems of this business, the association was told by Dr. Richard J. Gonzalez, treasurer of Humble Oil & Refining Co.

Addressing an open meeting of the I.P.A.A. tax study committee, Gonzalez presented a succinct analysis of the charges against the depletion provision and outlined the answers the industry can use to defend its position. His main points:

Differential treatment is not preferential treatment. The tax laws are full of special provisions designed to be fair to taxpayers.

Oil taxation must be different because of the unique process involved in exploration and development, which is quite unlike that encountered in manufacturing and trade.

What is depleted through production is the value of oil after it is discovered. The present allowance of 27½ per cent of gross income but not more than 50 per cent of net income works out to about 23 per cent of the value of all oil produced, or 71 cents per barrel.

Experience has shown the present tax provisions to be reasonably related to the peculiar risks and problems encountered in exploration, drilling, and production. They are a rough equivalent of capital-gains treatment, thereby encouraging successful operators to stay in business.

The charge that oil producers pay lower income taxes than most businesses overlooks the fact that a large part of reported income is really a capital gain. Also, charging off intangible drilling costs is a form of accelerated depreciation which reduces taxable income immediately but increases it in later years.

Oil production generates direct tax revenues of $1.80 per barrel. Federal income taxes paid by petroleum producers are 7.2 per cent of their gross revenue, compared with 5.0 per cent for manufacturing corporations and 3.9 per cent for all industry.

Higher taxes on producers would raise oil prices and increase the cost of two-thirds of the nation's supply of energy.

Unity required . . . Gonzalez also warned against attempts to divide the industry through proposals to deny the full percentage depletion to all producers.

Graduated depletion, with more favorable treatment for small producers, is based on the supposition that small ones have higher risks, he said, but actually there is little difference because big companies drill more expensive wells and spend more on exploratory work, and both need to be encouraged to explore.

The argument that depletion should be denied foreign operators because its purpose is to develop oil at home is fallacious, Gonzalez said, because it ignores the fact that the purpose of the depletion provision is to avoid taxing the return of capital, and this principle should be applied to American corporations operating anywhere.

"Orphan Ideas" at Indiana Standard Are Given a Home

STANDARD Oil Co. (Ind.) is establishing a home for "brain children."

Operating on the theory that research theories of scientists often die for lack of a place to put them, Standard of Indiana has created a "Committee for the Evaluation of Research Suggestions."

"We want to make sure no good idea dies an untimely death," Research Manager P. C. White said. "In addition, we want to encourage broad thinking. Often the scientists working on a project become so close to it they miss its outside relationships."

White said a good example of where petroleum scientists missed the boat was in the development of polyethylene. Oil cracking was developed more than 40 years ago, but the petroleum scientists failed to see the possibilities in the olefins that cracking made available.

"If petroleum scientists had been thinking more broadly, they might have developed the petrochemical business right away," White said. "Instead, petrochemicals came in slowly, and the pioneering was done by the chemical industry."

The new committee for "orphan ideas" will be headed by Standard's Dr. Ernest W. Thiele, associate director of research. The committee will evaluate ideas and then turn them over to the appropriate research division.

White explained that scientists at the company can take an idea to the committee even though a supervisor has turned it down.

"The scientist need not feel frustrated," White said. "He is encouraged to discuss his brain-child higher up the line. Everyone likes to talk about his brain-children. The new committee has been set up to listen."

This program is to safeguard . . .

. . . the security of this nation

The control boss is humble but tough

He's Capt. Matthew V. Carson, a line officer of the U. S. Navy, who looks a bit like a young Irvin S. Cobb and a little like John L. Lewis.

But the resemblance ends there. Humor seldom enters his conversation, and he speaks softly and thoughtfully. He's not what you'd call an extrovert, and he doesn't stand out in a crowd. But as he answers tough questions on the control program, his knowledge of the economics of the oil industry becomes impressive.

He learned something about oil during 2 years as deputy director of the Navy's petroleum reserves between 1951 and 1953 and another 6 months as director. But most of his knowledge of the industry, he says, has come since he was called to Washington unexpectedly just 3 months ago and handed the imports job.

Although he was a Texas lawyer before entering the Navy in 1940, most of his service has been line duty. During the war he commanded sub chasers and destroyers in the Pacific.

How did he happen to get the assignment? He isn't sure. A clue lies in the fact that several important people think very highly of him—people like Herbert Hoover, Jr., Gen. Ernest O. Thompson, Interior Secretary Fred Seaton, Treasury Secretary Robert B. Anderson, and Anderson's predecessor, George Humphrey.

How Oil Imports Will Be

An interview with

Q. What do you require of a firm which wishes to bring in foreign oil and which is not now an importer?

A. First we insist that a company have a legitimate interest in importing. Perhaps it is a refiner. Perhaps it is a domestic firm with foreign production.

A broker, looking to the purchase of foreign crude for sale in this country, would not qualify. He does not have an interest we ought to foster.

Q. When you speak of a domestic firm with foreign production do you mean to include companies which have no refining facilities?

A. Well, now, if a producing company goes abroad and establishes production, and it has no refineries to process the crude, I would say there are two ways in which it could bring crude into this country.

One, it could build a refinery. This would take a couple of years, of course. Or, it could sell its crude to a refiner or a marketer which could qualify as an importer. In such a case, this refiner or marketer would be the importer of record.

Now, however, if the crude-oil producer should make a processing arrangement with a refiner but would take back and market the products, then the producer would be the importer of record.

Q. This means, then, that the company which develops foreign oil does not automatically qualify for an allowable of some sort?

A. That is correct. It would depend on the intended disposition of the crude oil in this country.

Q. What factors do you consider when passing on an application from a new importer?

A. I intend to look at many factors, including, for example, the geographic location of the refinery, its actual competitive position considering the crude source of other refiners in the area, where the company's marketing area is and the competitive situation there, and the competitive impact of granting the request.

For instance, suppose an inland refiner would propose to import foreign crude and trade it to some coastal refiner for crude in the interior. I would not think he would have a very good case. This type of case is one that would appear to be directed at an economic gain, and not one necessitated by the competitive pressure in the company's marketing area.

Will mandatory controls be imposed?

I hope it doesn't come to that point

Controlled During the Months Ahead

the administrator, Capt. Matthew V. Carson

Q. How do you plan to accommodate legitimate new importers?

A. Well, at this time it's infeasible to ask older importers to move over and let new importers into the field.

The expected increase in demand, however, will permit an additional 30,000 to 35,000 bbl. a day to be imported without affecting the formula. But there is a question as to whether some of this 30,000 or 35,000 bbl. should not go to the older importers. Personally, I think a portion of it should.

Q. There is some feeling in the industry that a company which qualifies as a new importer is automatically entitled to 12,000 bbl. daily. Would you comment on this?

A. The maximum is 12,000. As you know, in the Crown Central case we set the figure at 5,000 bbl., although the company had requested 20,000 bbl.

Q. Do you mind telling how you arrived at this 5,000-bbl. figure for Crown Central?

A. That's a fair question. Crown Central has a refinery on the Gulf Coast. Its marketing area is on the East Coast, and the company correctly contends that 95 per cent of its products are marketed in that general area.

However, Crown Central, itself, markets only about 21,000 bbl., including 15,000 bbl. of gasoline, although its total refinery demand is 37,000 or 38,000 bbl. a day. So actually it markets only about 50 per cent of its total on the East Coast. It sells the other 50 per cent on the Gulf Coast for delivery and marketing by others on the East Coast.

Now the provisions of this control program suggest that new importers be allowed to enter and share in the U. S. market in a "reasonable manner." We felt that 5,000 bbl. was a reasonable amount for Crown Central.

Q. What would happen if product imports should get out of hand to the extent that they might nullify the present control program?

A. We are going to have a seasonal increase in product imports. That's to be expected.

But if product imports should reach such a magnitude that they threaten the present program, I'm sure they would be brought under the same type of plan. It is the responsibility of the Office of Defense Mobilization to certify whether the level of product imports poses a threat to the national security and to recommend action to the President.

Q. If the voluntary control plan does not work, will there be mandatory control of some sort?

A. I don't know whether mandatory controls will be necessary. It could be that too wide a margin of noncompliance by one or two importers might force others to the conclusion that they must review their position. I hope it doesn't come to that point.

Actually, this program is designed to safeguard the security of this nation, as well as to insure a healthy petroleum industry. I hardly see how a company that is responsible to the public interests as well as to its stockholders can ignore the provisions of this voluntary program.

Q. Sun Oil Co. has said it cannot go along with the program because of the fear of antitrust prosecution. Would you comment?

A. I've talked with Mr. Dunlop (Robert G. Dunlop, Sun's president) and others and I feel they're perfectly honest in their convictions.

I do feel that their fears are not well founded. I think Sun is overcautious. I wouldn't be asking com-

panies to cooperate in a plan which I feel might expose them to prosecution.

Actually, Sun Oil Co. will be in substantial compliance with the program within a few months. They already have reduced imports, and I sincerely hope they cut some more. I see no compelling reason why they should not bring their import level into line with the committee recommendations.

Q. Will increased consumption world-wide help solve the imports problem?

A. It will help. Certainly the world market outside the United States will take an increasingly greater share of future demand. Consumption outside this country is growing at a faster rate than it is here.

Q. What comment do you have about the importation by the military of products bought outside this country?

A. I can understand the concern within the oil industry. This is not something, however, which has just come to pass. It's been going on a long time.

Now the Buy American Act was designed to encourage the U. S. Government to buy locally where possible to do so. But certain purchases by the Armed Services were exempted.

You must remember that appropriations for defense are in dollars, not barrels. And with just so many dollars you can buy only so much.

Too, the Armed Services are required to solicit bids. And if an award were made to some one other than the lowest responsible bidder, someone would be in trouble with the comptroller general.

This is not to say this cannot be changed. It hasn't to date.

Q. What exactly is your job, that of a watchdog?

A. Yes, a watchdog in a sense. I determine the extent of compliance with the imports program. I also hear petitions of importers on inequities, and I have authority to correct any inequities found to exist.

Q. It has been said that product imports will be reviewed on a semi-annual basis, as will crude-oil imports to the West Coast. Are you the reviewing officer?

A. The cabinet committee report says that product imports should be kept under surveillance by the Office of Defense Mobilization and the Department of Interior.

I am attached to the Interior Department, but such surveillance is not my responsibility. West Coast imports will be reviewed by the cabinet committee, probably late in November or early in December.

Q. A military man is seldom asked about his personal feelings when given an assignment. Do you as an individual feel that imports controls are essential?

A. I certainly do. I think there is absolutely no question about it. Control is essential to the security of this country and is necessary to preserve a healthy oil industry.

In the best interests of its people and world peace, the United States Government cannot allow the health of its domestic petroleum industry to be undermined. Neither can we assume the costly liability of a petroleum industry which is too heavily dependent upon sources of petroleum outside our shores.

Kermac Buys Gulf Lines

Deal means expansion of Kerr-McGee gathering system. Both companies say Gulf contempt citation isn't involved.

KERR-McGEE Oil Industries, Inc., has bought 1,100 miles of pipeline gathering facilities in Oklahoma from Gulf Refining Co. The move doubles the size of Kerr-McGee's gathering system and provides a plentiful supply of crude for its Oklahoma refineries.

Both Kerr-McGee and Gulf said the sale has nothing to do with the Oklahoma Corporation Commission's move to cite Gulf for contempt in failing to take its full production allowable in August.

The companies said negotiations for the sale began long before the citation was issued and that local crude purchases within the state will not be affected. However, there may be some rearrangement of purchasing contracts because of Kerr-McGee's plan to use the Gulf lines to supply its own refineries and halt certain buying from other sources.

Expansion for Kermac . . . By acquiring the new lines, Kerr-McGee now becomes one of the biggest owners of gathering systems in Oklahoma. When the sale contract becomes effective January 1, the company will have 2,400 miles of lines.

The present 1,300-mile system of Kerr-McGee gathers about 21,000 bbl. of oil daily, and the new system will about double the take. The company's two Oklahoma refineries at Wynnewood and Cushing have a combined capacity of 40,000 bbl. per day. This capacity, in the past, meant that Kerr-McGee had to buy some 15,000 to 18,000 bbl. daily from outside sources.

A company spokesman explained that since Kerr-McGee bought Deep Rock Oil Corp. in the spring of 1955 and thus acquired a retail outlet, it had not gathered as much Oklahoma crude as it had to run its refineries.

Kerr-McGee plans to continue purchasing all the crude that Gulf has been taking. The company will reduce purchases from some of its present sources, but the spokesman said the "rearrangement of crude supply won't cause much more than a ripple."

Kerr-McGee has been Oklahoma's seventh largest crude buyer and Gulf the ninth-largest.

Gulf's position . . . At Houston, a spokesman for Gulf Oil Corp., parent company of Gulf Refining, said the sale will not affect continuation of the company's exploration, production, and marketing activities in Oklahoma.

Speculation had risen in the industry that Gulf was getting rid of its gathering system in the state because of its differences with the Corporation Commission. Gulf has been ordered to appear before the commission November 27 to answer a citation for contempt of the commission's allowable order.

Gulf has challenged the commission's authority to force it to purchase the full allowable. The commission contends the order does not force Gulf to purchase more crude than it can handle but simply requires the company to apply for relief—an action which Gulf did not take.

A Gulf spokesman said last week that the contempt citation "had no bearing on the sale of the pipeline gathering facilities as negotiations for their sale were under way prior to the Corporation Commission's action."

Similarly, a Kerr-McGee spokesman said: "We talked to Gulf about this sale long before they had any trouble with the commission. It's been in the mill for a long, long time. I think they are selling because they have a high-cost operation that is not economical for them."

Jurenev reports his committee's findings:

Crude Output Next Year Will Be Higher Than Now

DALLAS. — Production next year should average about 420,0000 bbl. a day more than the current rate.

That's the conclusion of the supply-demand committee of the Independent Petroleum Association of America.

During October output averaged about 6,750,000 bbl. daily. Next year it will be about 7,195,000 bbl. daily.

Actually, the 1958 forecast is close to what is expected to be the over-all average production for this year. But 1957 was unusual because of the high rate of production early in the year which resulted from the Suez crisis.

The committee, headed by Continental Oil Co.'s Serge B. Jurenev, predicts domestic demand will rise 3.3 per cent next year. A big drop in exports, however, will cut total demand to a gain of only 0.7 per cent. The drop in exports represents a return to normal from the high 1956 and 1957 figures caused by Suez.

The committee pegged its forecast on two assumptions:

. . . General business activity will get no higher than it is now—and may slip just a little.

. . . Normal weather, a little cooler than the past heating season, will prevail.

The 3.3 per cent gain in domestic demand predicted for 1958 is an improvement over the 1.9 per cent increase estimated for 1957, but it is well below the average yearly gain of 5.3 per cent chalked up during the 1950-55 period.

Such a demand increase points to the need for a total new supply of 9,559,000 bbl. daily, the committee said.

It figured that crude-oil imports would provide about 1,000,000 bbl. daily of this, domestic crude-oil production would add 7,195,000 bbl., and the remainder would be made up by product imports and domestic production of natural-gas liquids. It did not publish its estimates for these.

The committee placed 1958 exports at 333,000 bbl. daily, a drop of 40.5 per cent from an estimated 1957 figure of 560,000 bbl. a day.

Total inventories at the end of 1957, the committee said, will amount to 805,000,000 bbl., a gain of almost 25,000,000 bbl. for the year. To meet the demand forecast for 1958, there is no need to increase inventories above the 1957 levels. The balancing stock gain for the year is only 8,000 bbl. daily.

The I.P.A.A. Supply-Demand Forecast

(Thousands of barrels daily, except closing stocks)

	3rd quar. 1957	4th quar. 1957	Year 1957	1st quar. 1958	2nd quar. 1958	3rd quar. 1958	4th quar. 1958	Year 1958
Total demand	**8,680**	**9,860**	**9,481**	**10,250**	**8,910**	**8,940**	**10,100**	**9,551**
Gasoline	4,181	3,930	3,968	3,735	4,235	4,275	4,045	4,073
Kerosine	193	415	314	455	175	195	410	308
Distillate	1,193	2,170	1,843	2,605	1,370	1,290	2,230	1,874
Residual	1,359	1,725	1,631	1,860	1,460	1,325	1,720	1,592
Other	1,764	1,620	1,725	1,595	1,670	1,855	1,695	1,704
Exports	**375**	**340**	**560**	**315**	**340**	**340**	**335**	**333**
Gasoline	100	90	106	80	85	90	85	85
Kerosine	5	5	14	5	10	5	10	7
Distillate	89	70	130	60	70	70	70	68
Residual	96	75	106	70	75	75	70	73
Other products	52	70	68	70	70	70	70	70
Crude	33	30	136	30	30	30	30	30
Domestic demand	**8,305**	**9,520**	**8,921**	**9,935**	**8,570**	**8,600**	**9,765**	**9,218**
Stock change	**517**	**—488**	**67**	**—600**	**505**	**522**	**—402**	**8**
Crude	— 58	— 76	16	— 11	99	....	— 43	11
Products	575	—412	51	—589	406	522	—359	—3
New supply	**9,197**	**9,372**	**9,548**	**9,650**	**9,415**	**9,462**	**9,698**	**9,559**
Imports								
Crude	(†)	(†)	(†)	*1,000	*1,000	*1,000	*1,000	*1,000
Products	(†)	(†)	(†)	(†)	(†)	(†)	(†)	(†)
Production								
Crude	(†)	(†)	(†)	7,170	7,100	7,240	7,260	7,195
Natural, etc.	(†)	(†)	(†)	(†)	(†)	(†)	(†)	(†)
Runs to stills	**7,958**	**7,962**	**7,983**	**8,108**	**7,898**	**8,134**	**8,193**	**8,087**
Closing stocks‡	**850**	**805**	**805**	**751**	**797**	**845**	**808**	**808**
Gasoline	177	186	186	208	185	174	185	185
Kerosine	36	31	31	21	30	37	31	31
Distillate	171	139	139	80	115	165	139	139
Residual	58	52	52	45	50	58	52	52
Other and natural	129	125	125	126	137	131	125	125
Crude	279	272	272	271	280	280	276	276

*Crude imports assumed to be in the general range of 1,000,000 bbl. per day in conformity with the Government's voluntary program. †No data released. ‡Millions of barrels.

PERCENTAGE INCREASES IN DOMESTIC DEMAND
(1958 over 1957, by quarters)

	Quarters				
	1st	2nd	3rd	4th	Year
Gasoline	3.1	4.4	2.5	3.1	3.3
Kerosine	0.2	0.6	6.7	—2.4	0.3
Distillate	4.3	6.7	10.5	2.9	5.4
Residual	—0.3	—0.7	—1.0	....	—0.4
Other	3.3	9.3	4.5	4.9	5.5
Total	2.7	4.7	3.6	2.6	3.3

REMARKABLE THICKENING power is unleashed by ½ ounce of "polyox" resin (left) when dissolved in pint of water. Industry is watching, because this important . . .

New Polymer Discovery

. . . may open door to new field in petrochemistry. Union Carbide sees wide use, including possible application in drilling muds. Major plant is planned for 1960

A NEW CLASS of petrochemicals based on ethylene promises to bolster still further the market for this major building block. Some of its unique characteristics may in turn find usage in the petroleum industry—possibly in drilling muds.

The newcomer is po'yox, a straight-chain polymer of ethylene oxide. With a catalytic technique which promises to open up an entirely new field of polymer chemistry, Union Carbide Chemicals Co. can now link together as many as 500,000 ethylene-oxide molecules to make a crystalline, water-soluble material that has exceptional thickening properties when dissolved in water.

Just how much market lies in this new material remains to be seen. Typically, the know-how for making polyox precedes the full appreciation of what end uses it might have.

But Carbide is sufficiently certain of its usefulness to be building a plant to make sizable developmental quantities for interested companies. On the drawing boards for completion in 1960 is a major-size commercial plant.

What's involved . . . Carbide has found that when they reached molecular weights of 70,000 and over, the ethylene-oxide polymers took on new characteristics. The resin is ductile and can be cast, calendared, or extruded into tough, inherently flexible films.

The water solubility of polyox points to interesting uses. Very low concentrations show exceptional thickening characteristics.

The resin is now available in 50-lb. lots in grades termed WSR-35, WSR-205, and WSR-301. Smaller quantities of the highest molecular weight WSR-701 are also available.

In these grades, the first number or the first two numbers refer to the viscosity in hundreds of centipoises of water solutions indicated by the last number. WSR (water soluble resin) 301 shows 3,000 centipoises of a 1 per cent solution.

Possible markets . . . One of the most likely early uses for polyox resins appears to be as a substitute for starch in sizing cotton warp before weaving it into cloth.

The market for starch in the cotton field alone today amounts to about 350 million pounds per year. Roughly one-quarter the tonnage of polyox will do the same job, according to Carbide, indicating a possible outlet for close to 100 million pounds in that field alone. Studies in sizing other fibers promise a further market.

The thickening, water solubility, and other properties of this petrochemical resin point to still other end uses in the drug, cosmetic, detergent, paper, packaging, and food fields.

Possible application in drilling muds has not yet been investigated, but Carbide may look into this.

Much work remains . . . Polyox is not soluble in aliphatic hydrocarbon liquids, and it has low solubility in aromatics. Its possible use as a water-soluble lubricant additive is being studied. But the high viscosities of water solutions decrease as shear increases. This property, called pseudoplasticity, is reversible if shear rates are not so high that the largest molecules are not ruptured.

Some of these eventual possibilities are still gleams in Carbide's eye. Much evaluation work remains to be done.

But the interest from industry and the presently foreseeable uses leave Carbide with the strong impression that here lies an important new material based on one of its long suits—ethylene oxide.

Price . . . Carbide's price in developmental quantities today is $1.50 per pound with the warp-sizing grade placed at 75 cents. It feels that when commercial production is realized the three lower molecular-weight grades can drop to a price of about 35 cents per pound in terms of today's dollar.

Navajos Ask More Royalty

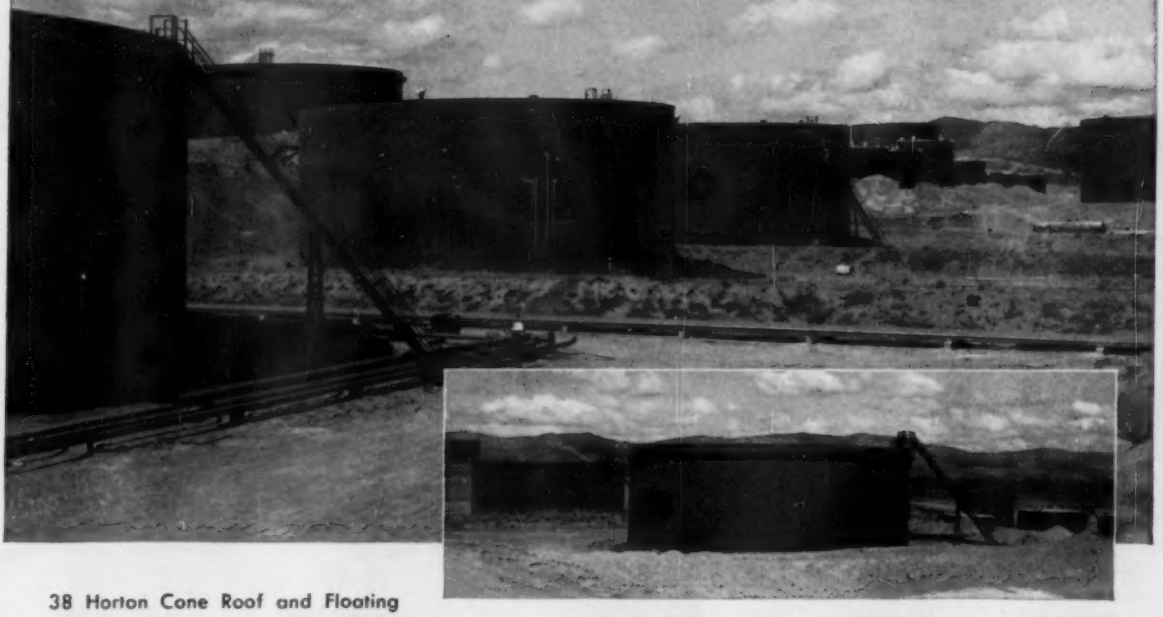
WINDOW ROCK, Ariz. — The Navajo Indian tribe will ask for a one-sixth royalty instead of the customary one-eighth when it conducts a sale here December 10 of oil and gas leases in the Four Corners area.

The Navajos are taking advantage of a new U. S. Interior Department policy allowing certain tribes to modify their royalty requirements to any figure decided on by tribal councils.

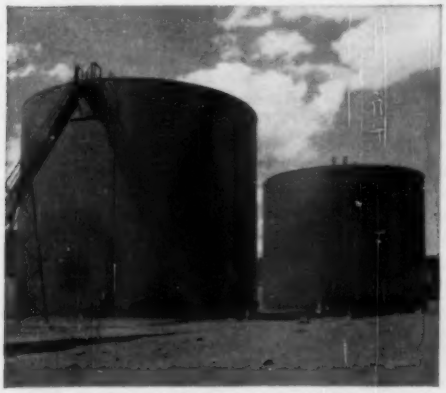
The lease sale consists of 33 tracts, all in San Juan County, Utah. They comprise 6,354 acres of tribal lands and 1,040 acres of individual Indian allotted lands. Tribal officials said that if bonus bids are below expectations, the royalty probably will be returned to the one-eighth level for three larger sales.

at Santiago de Cuba:

HORTON TANKS provide storage facilities for New TEXACO REFINERY



38 Horton Cone Roof and Floating Roof tanks fabricated and erected by CB&I serve Texaco's tankage requirements at Eastern Cuba's first refinery —located near Santiago de Cuba.



Thirty-eight Horton® tanks handle storage requirements for The Texas Company's new $14 million refinery located near Santiago de Cuba.

The 20,000 barrel per day operation is Texaco's most recent expansion in 40 years of marketing fuel oil and lubricants in Cuba and is expected to considerably increase the country's refining capacity.

Horton Cone Roof and Floating Roof tanks on the 400-acre site of the refinery range in capacity from 755 to 131,000 barrels.

Whether it's in Cuba or Zanzibar— CB&I's *global representation* for the design, fabrication and erection of petroleum storage tanks, or processing structures stands ready to serve you with a *world of experience.* Whether you are building new—or expanding, see CB&I *early* in your refinery planning. Write our nearest office for details.

P59

Chicago Bridge & Iron Company

Plants in: BIRMINGHAM, ALA. • CHICAGO, ILL. • GREENVILLE, PA. • SALT LAKE CITY, UTAH

REPRESENTATIVES, LICENSEES and SUBSIDIARIES: Australia—Bernard-Smith (Pty.) Limited, Alexandria (Sydney); Evans Deakin & Co. Ltd., Brisbane • Canada—Horton Steel Works Limited, Toronto • Cuba—W. P. Bryant, Edificio Abreu 402, Havana • Brazil—Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro • England—Chicago Bridge Limited, London; Whessoe Limited, Darlington • France—Constructions Metalliques de Provence, Arles-sur-Rhone; S. A. Ateliers et Chantiers de la Seine Maritime, Le Trait • Germany—Wilke-Werke AG, Braunschweig; Gutehoffnungshutte, Oberhausen-Sterkrade • Italy—Compagnia Tecnica Industrie Petroli, Rome • Japan—Ishikawajima Heavy Industries Co., Ltd., Tokyo • Netherlands—Comprimo N. V., Amsterdam • Scotland—The Motherwell Bridge & Engineering Co., Ltd., Motherwell • Venezuela—Chicago Bridge & Iron Company Ltd., Caracas

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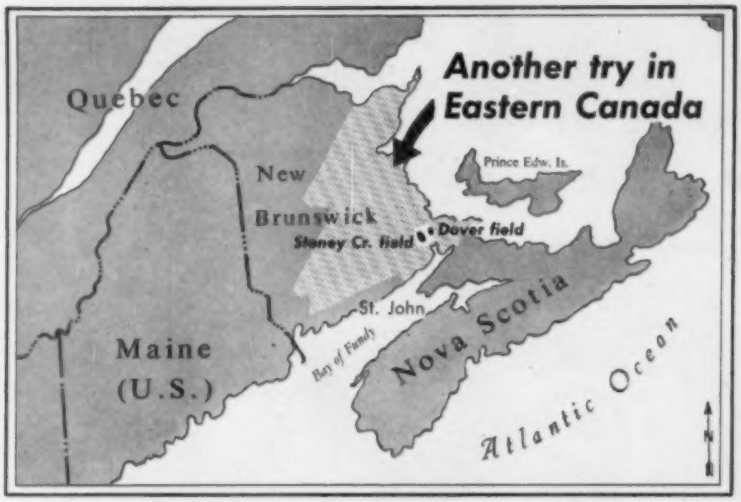


The striped portion above is the Crown Lease acreage reopened for exploration as . . .

Imperial Eyes New Brunswick

A NEW exploration and drilling program has been virtually assured in eastern Canada's New Brunswick, where oil was first found nearly 100 years ago.

New Brunswick Oilfields, Ltd., has disclosed the terms of an agreement with Imperial Oil, Ltd., for exploring 1 million acres of crown-lease lands in the eastern half of the province.

Province authorities must give approval before the 7-year sublease agreement can take effect.

The agreement is expected to produce an extensive development effort in the long-neglected New Brunswick area, where a flurry of drilling excitement occurred 2 years ago and then died down.

In 1955, Orville H. Parker, Ponca City, Okla., independent operator, hit a producer in the aged Stoney Creek field. But Parker's well failed to produce enough crude to meet his obligations to New Brunswick Oilfields, and the drilling program stopped.

The terms . . . Imperial Oil's new agreement with New Brunswick Oilfields requires a $200,000 payment at the outset and a minimum outlay of $400,000 within 3 years for geological work, exploration, and drilling.

Imperial can terminate the agreement at the end of 3 years or keep it intact for a total of 7 years by spending a minimum of $1,300,000. Acreage which Imperial may explore is about 10 per cent of New Brunswick's Oilfields' total crown lease (see map). Imperial has until November 5 to select the 1 million acres it will explore—but must keep hands off the 5,000 acres of Stoney Creek field.

Imperial must pay crown lease royalty and also a 7½ per cent royalty to the New Brunswick Oilfields on any proration of oil and gas.

At present an exploratory well is being drilled 1 mile west of Stoney Creek and has produced gas in the first level of sands penetrated.

"Further drilling is necessary to determine the productive size of the well and whether or not it represents an extension of the present Stoney Creek field or a new field," Reginald B. Elwell, president of New Brunswick Oilfields, told company shareholders.

A century ago . . . The first drilling in the area occurred at nearby Dover field in 1859, when Dr. H. C. Tweedel, a chemist, sank four wells—the deepest 190 ft.—at virtually the same time Col. Edwin L. Drake was drilling the first commercial oil well in Pennsylvania. Upon learning that Drake had hit, Tweedel quit drilling on the theory that "there's only room for one real oil well in North America."

Tweedel's wells found oil and gas, but he had water troubles. The adjacent Stoney Creek field was discovered in 1909. Production today is small.

Parker's well, within the same field, looked like a good one in 1955, but what was thought to be a 100-bbl.-per-day producer actually flowed about 15 bbl.

—— Industry briefs

Trice Production Co., which has drilled 10 producing oil wells on a Houston city dump, now has spudded its first test on the city prison farm.

The test, projected to 9,000 ft., is about 10 miles southeast of downtown Houston, on a city lease covering some 331 acres. Trice was the lone bidder for the acreage with an offer of $8,275 plus 25 per cent royalty.

A new drilling tender, the Carl B. Anderson, was commissioned at the Madisonville, La., shipyard of Equitable Equipment Co., Inc., last week for An-Son Offshore Drilling Co.

The offshore firm, with headquarters in New Orleans, was organized recently by officials of An-Son Drilling Co., Oklahoma City. Carl B. Anderson is chairman of the board. President is Carl B. Anderson, Jr., and vice president and manager of operations is George H. Troxell, Jr.

National Steel & Shipbuilding Co., San Diego, has been awarded a $750,000 contract to construct the first offshore drilling platform of Standard Oil Co. of California, Western Operations, Inc. The contract is for the basic platform only. Other contracts will be awarded later.

California Standard hopes to start drilling on its 5,500-acre offshore lease at Summerland next May. The company is operator on the lease held jointly with Humble Oil & Refining Co. The platform will accommodate two rigs and have a capacity of 25 wells.

J. H. Agen has sold 31 producing oil wells and equipment in Montana's Kevin-Sunburst field to Twentieth Century Fuels, Inc., Reno, Nev., for $200,000. Officers of the Reno firm are officers of the Twentieth Century Fox motion-picture company.

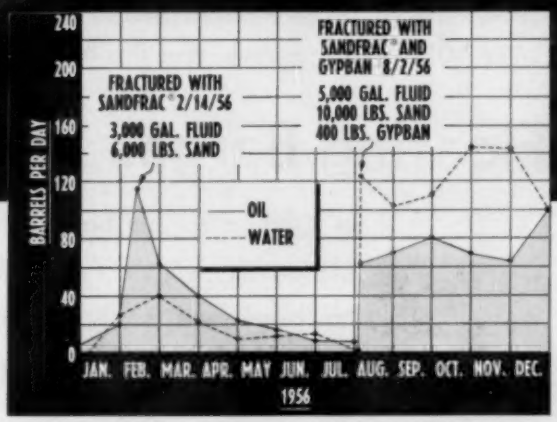
Trouble last week finally caught up with the world's second deepest well.

Drill pipe was stuck at midweek at Pan American Petroleum Corp. 1-CS University, 13 miles southeast of here in Pecos County, after the deep test had reached a depth of 21,687 ft.

The mishap was the first real difficulty encountered by the 1-CS University since it was spudded 13 months ago. If it persists for long, the hole likely will be abandoned.

Pan Am, only a short time before, had amended its drilling contract to go to 22,000 ft.—only 570 ft. short of the world's record.

Plugging action of gyp, shown here in this deposit taken from oil well tubing, can now be prevented with Gypban.



Here are oil and water production curves on a well fractured with and without Gypban. Following treatment with Gypban, increased production was sustained for over five months — unrestricted by gyp deposits!

NEW!

GYPBAN PREVENTS GYP DEPOSITS

In many wells abnormal production declines result from gyp deposits. Calcium carbonate and sulfate clog formations, collect on rods, pumps and tubing to restrict production. These deposits make frequent workovers necessary—increasing your production costs.

To solve this problem, Dowell now offers Gypban*—a new complex phosphate that acts as a stabilizing agent to retard gyp deposit. Injected into the producing formation, it dissolves slowly in the produced water to give *long-term protection.*

Gypban is granular in form. It can be squeezed directly into the formation or mixed with the sand during a fracturing job. Oil or water-base fluids may be used as the carrying medium

With Gypban you get sustained protection instead of just temporary relief. Some wells that had previously required monthly workovers to remove gyp now give good production for six months or more after a treatment with Gypban.

The use of Gypban is recommended in any well where gyp deposits are the suspected cause of rapid or unusual decline rates. The formation may be plugged with gyp even though the tubing is free from scale.

Gypban is now available from any of the 165 Dowell service points in the U. S. and Canada. In Venezuela contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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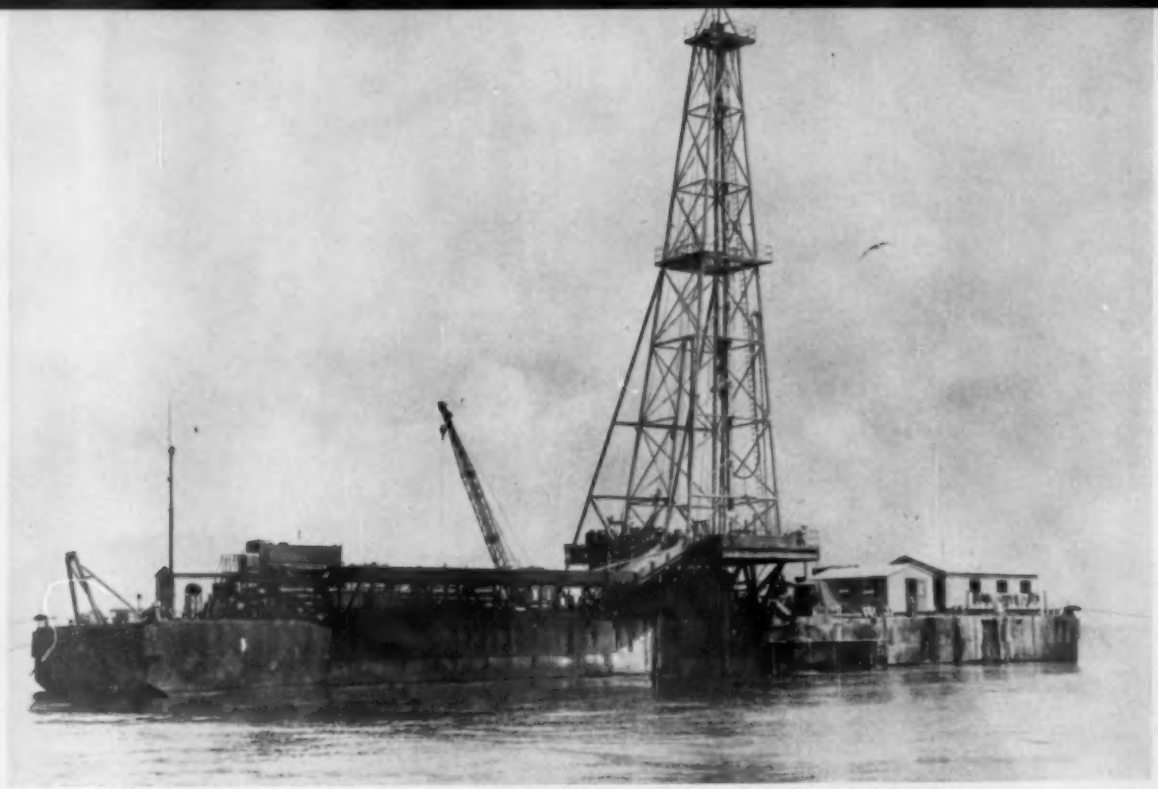


The "Champion", above, and the "U-303", opposite page, are two floating barges . . .

Floating Barges to Drill in Deep Waters

● Drilling so far has been for sulfur, but oil is the principal target. Exploration will start soon off Louisiana from anchored barge. Technique has been used mostly in shallow water during trial period but can be used in depths of hundreds of feet.

HOUSTON.—Drilling from a floating barge soon will be conducted for the first time in Gulf of Mexico oil exploration.

The technique is similar in many ways to that used for core drilling in the Pacific Ocean off the coast of California (OGJ, Oct. 7, p. 100). It has been perfected during the past 18 months in highly secretive operations for sulfur companies in the Gulf of Mexico.

Plans for strat drilling off the coast of Louisiana were revealed jointly by Brown & Root Marine Operators, Inc., and McClelland Engineers, Inc., both of Houston.

The two companies have quietly developed two barges which have proved efficient in exploratory drilling for sulfur. The barges are part of the Brown & Root offshore fleet. McClelland owns the drilling equipment aboard the vessels and is subcontractor on drilling assignments.

What's been done . . . In a surprise announcement, the firms disclosed that the two barges have just completed a 34-well drilling program off Galveston and High Island for a sulfur company. Most of the wells were in the 2,000-3,000-ft. drilling depth range, with the deepest going to about 3,200 ft.

However, with present equipment, strat tests can be drilled to 6,500 ft.

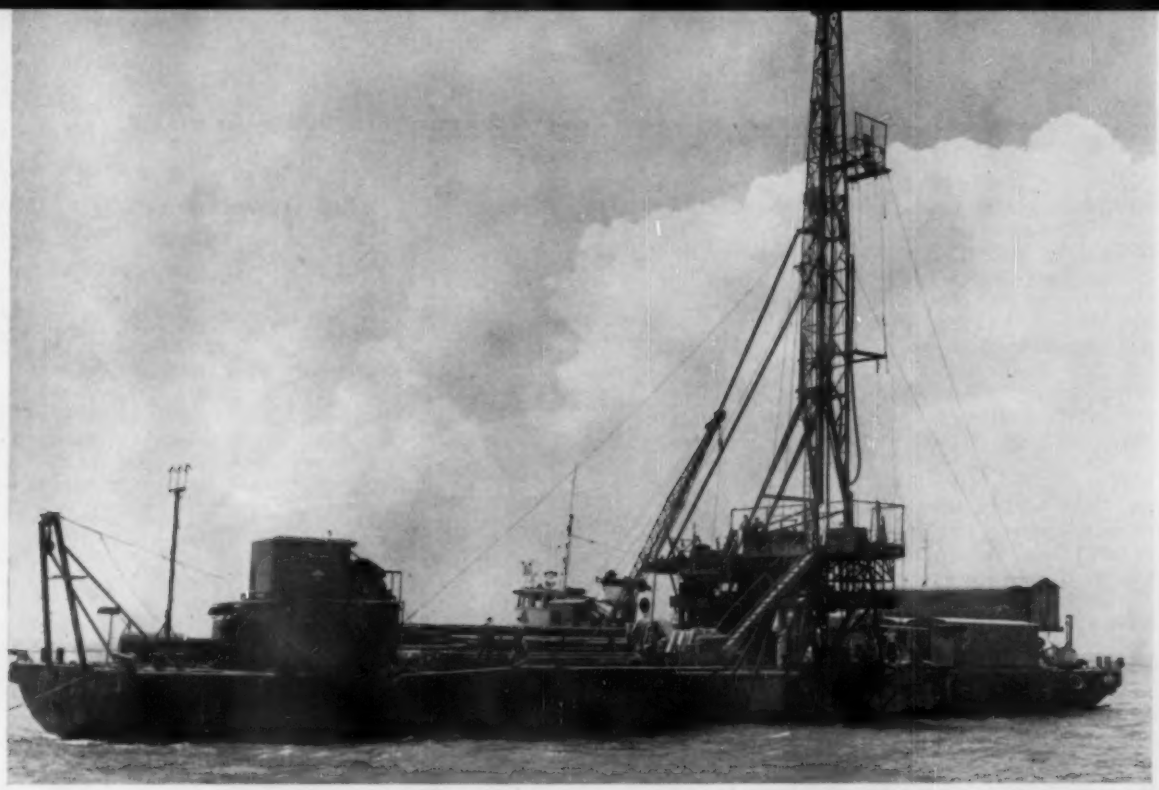
"Techniques already proven in the Gulf of Mexico and elsewhere permit application of this method to exploratory drilling to any depth required and in any water depth up to several hundred feet," the companies announced.

The "Champion," larger of the two barges, is expected to go to work for a major oil company off the Louisiana coast in the near future. The name of the prospective operator was not disclosed.

What's in future . . . The first exploration work for the oil industry in the Gulf of Mexico may be primarily in search of promising oil structures rather than for actual production of oil. But perfection of the technique may lead to its widespread use for wildcatting, especially in water depths of 150 ft. or more.

The development also is likely to speed up perfection of the first system of underwater completion of wells in the gulf. Experimental work on ocean-bottom completions is now being conducted by several companies. As far as is known, all completions in the gulf to date have been with the wellhead above water.

"Production drilling for oil and gas can be economically accomplished by combining our procedures with suitable underwater completion techniques now being developed," McClelland and Brown & Root state in a jointly prepared brochure.



. . . that have been operating off Galveston and soon will make history farther offshore.

of the Gulf

The deepest water in which the oil industry has operated stationary platform rigs to date is about 118 ft. This is believed to approach the maximum economic limit for completion of wells above the water surface.

But by combining the new floating drilling structures with a technique for subsea completions, operators could drill in gulf waters to 600 ft. deep and extend exploration to cover an area 100 miles parallel to the coast and south to the edge of the Continental Shelf.

Started 2 years ago . . . Brown & Root and McClelland, the only companies known to have drilled from floating barges in the Gulf of Mexico, joined forces in 1955. Late in the year, they started a 13-well drilling program off San Luis Pass on the Texas coast for Freeport Sulphur Co.

Back as far as 1954 McClelland had been using various types of floating vessels for drilling soil tests in the gulf. These holes were limited to depths of about 500 ft. and were used in foundation studies for offshore platforms.

The firm, headed by Bramlette McClelland, had been making soil analyses for foundations for several years. It got into the offshore business when a demand developed for soil studies at the site of drilling structures. R. L. Perkins is vice president in charge of offshore drilling.

Barge statistics . . . The barge "U-303" (see photo) was put in service by the two companies in November last year. The vessel is 190 ft. long, 50 ft. wide, and 11 ft. deep. It is equipped with a Lee C. Moore jackknife derrick and a Failing Stratmaster trailer rig.

On location it is held in place by a system of anchors. With present equipment, the barge is designed for drilling to about 5,000 ft.

The second barge, "Champion," has equipment designed to drill to 6,500 ft. It is 220 ft. long, 55 ft. wide, and 18 ft. deep and is equipped with a Cardwell L-350 draw works powered by a GM twin 671 diesel with torque converter.

A former materials-handling barge, the "Champion" was brought to Houston and converted at the Brown & Root yard. It returned to sea as a drilling barge last May.

The newer addition to the drilling fleet is equipped with an unusual derrick designed especially by Brown & Root for floating drilling.

In the sulfur exploration, most of the drilling was done in water 15 to 30 ft. deep.

Drilling from each barge is done over the side from a cantilevered deck.

Comparison . . . Principal differences between the Gulf Coast barges and those used for core drilling off the West Coast are in the type of hull and in the extent of the anchorage system. The Gulf Coast barges are flatter and are said to hold more rigidly in place during drilling.

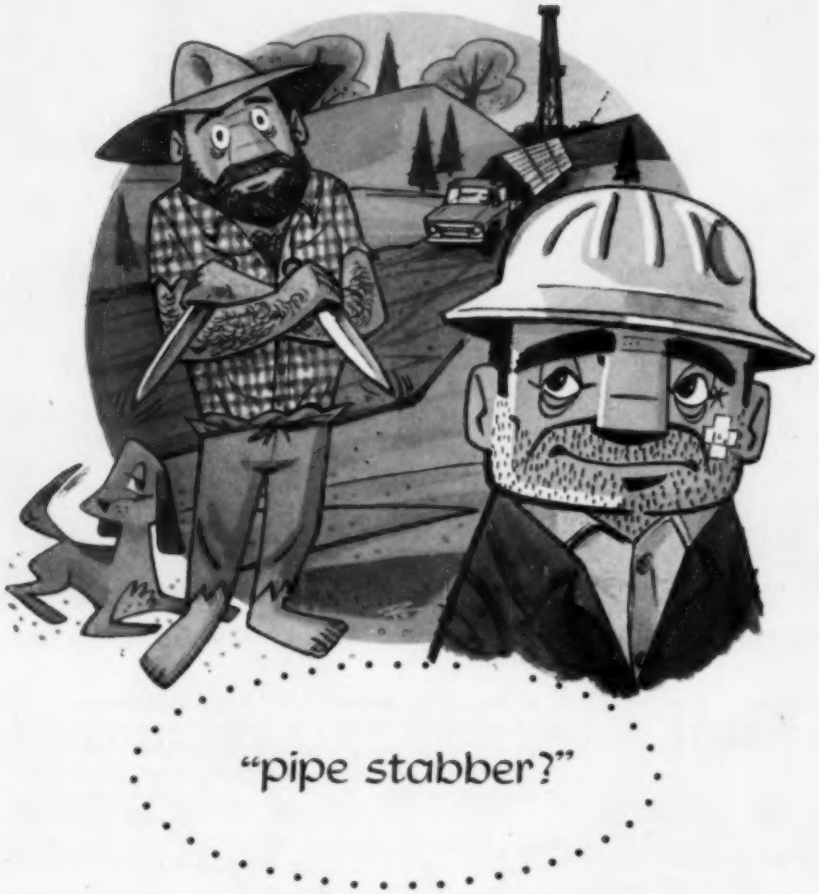
The West Coast deep-drilling experiment has been carried out the past year by the C.U.S.S. Group (Continental, Union, Shell, and Superior). Its drilling barge, CUSS I, has operated in waters 1,500 ft. deep and core drilled to a depth of 6,300 ft.

The C.U.S.S. method uses conventional blowout prevention and testing procedures on the ocean floor without the use of a diver. The surface casing, the casing head, and blowout preventers are lowered by guide cables, and then the packoff assembly is seated automatically atop these units. The operation can be completed in the deepest waters yet explored for oil.

The two gulf barges have made no effort so far to operate in waters as deep. The barges currently are at the Houston yard of Brown & Root for overhaul before returning to the gulf.

Brown & Root and McClelland Engineers also have made a series of borings from a floating platform in deep water between Maine and New Brunswick, Canada. The work was done for the tidal power project under study by the U. S. Corps of Engineers.

Congrats and $25 to S. G. McNatt, General Delivery, Bowman, North Dakota, for this quip.



Every day sees load after load of Lone Star API casing, tubing and line pipe leave the big Lone Star plant for the field. Constant research and the nation's most modern steel and pipe-making facilities are Joe Roughneck's guarantees that Lone Star pipe has what it takes. Depend on Lone Star . . . the oil country's steel mill.

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Corrosion Studied

● Progress is made in anticorrosion war, but problem isn't whipped

ODESSA, Tex.—Oil and supply men made their annual "Permian Basin Corrosion Tour" last week. Their verdict: Anticorrosion methods generally are doing good jobs but are not completely satisfactory.

The jaunt into oil fields near Odessa is sponsored by the National Association of Corrosion Engineers to acquaint the industry with corrosion damage and what is being done about it.

Those making the tour found that no method is successful in every case and that it takes a combination of methods in some places to defeat corrosion at a reasonable cost.

The rundown . . . Here are some of the protective methods the industry sightseers observed:

1. Organic inhibitors. These old standbys still are the most common protective methods, but they are now often getting a hand from protective coatings.

2. Tank coatings. Several types are in use. In general, they do a good job and last well, but there are cases of blistering.

3. In-place pipeline coatings. Results are generally good—but with some exceptions. Organic inhibitors are being used to give more complete protection.

4. Baked-on pipe coatings. This method, although high in initial cost, gives good protection with little upkeep expense.

5. Plastic pipe. Resistance to corrosion is excellent, but use is still low because of fear of its low impact and bursting strength.

6. Plastic tanks. Corrosion is completely whipped, but a few have collapsed, and others are troubled by oil seepage through the walls.

7. Cathodic protection of well casing. This new method looks good in some places, but there isn't too much history.

8. Cathodic protection of oil-handling vessels. This is a cheap way to add to protection obtained from inhibitors and coatings.

Sour crude problem . . . Sour crude creates a real problem of corrosion in the Permian basin. Because of it several new chemical and coating companies have sprung up in the area, and old companies have added new products.

Pipeline briefs

Richfield Oil Corp. is considering building a 100-mile pipeline from its Alaskan discovery to a deep water port on the Kenai Peninsula. Further drilling is expected to justify a line. The strike will stimulate drilling on nearby acreage held by several major companies, some of whom supported the Richfield test. Cooperative drilling agreements are being considered to evaluate the area.

Michigan Gas Storage Co. has awarded a construction contract to Bechtel Corp. for 40 miles of 12-in. and 12 miles of field gathering lines to utilize gas in Overisal field, Allegan County, Michigan. The main line will connect with the Michigan Gas system at Kalamazoo. The new field, discovered by Taggart Co., covers 6,080 acres. It has 38 wells and a reserve estimated at 50 billion cubic feet. Michigan Gas plans to buy the property from Taggart and develop it for eventual storage after depletion.

A transportation library has been established at the University of Tulsa in the name of Charles R. Musgrave, who retired recently as vice president in charge of supply and transportation for Phillips Petroleum Co. More than $2,000 was donated by Phillips and some 300 transportation leaders who honored him at a testimonial dinner in Tulsa last week.

Representatives of railroads, pipelines, trucking firms, and crude buyers and salesmen from all over the country attended the dinner. Musgrave spent a lifetime in transportation, first in railroading, then with Phillips, which he joined in 1922. His first job was carrying water to a pipeline construction crew in Glenn Pool, near Tulsa, in 1907.

Texas-New Mexico Pipe Line Co. is laying pipe on its 512-mile, 16-in. line from the Four Corners area to Jal, N. M. Panama, Inc., Houston, and Four Way Co., Inc., Aztec, N. M., have the construction contracts. The line will provide access to an additional 50,000 bbl. daily of crude in an area which now has a surplus. The line will connect with outlets to the Gulf Coast and Mid-Continent. It's scheduled to start operating next May or June. The bulk of the crude will go to The Texas Co. refinery at Port Arthur. It is considered an excellent crude for making high-quality lube oils.

Mississippi River Fuel Corp. has completed its 1957 expansion program raising capacity of the Gulf Coast-to-St. Louis gas system by 10,000,000 cu. ft. daily. Cape Construction Co., Inc., had the contract for 54 miles of 26-in. loop between Perryville, La., and Columbia, Ill. Pipe is in the ground and cleanup is almost complete. The company also installed 6,300-hp. in new compressor units.

A 182-mile, 10-in. gas pipeline will be built from Ghawar field, Saudi Arabia, to the city of Riyadh. Construction bids were received last week and contracts will be awarded soon. The line will be built and operated by the city.

North-West Oil Pipeline Co., organized by six West German refiners, will award contracts next week for a 230-mile, 28-in. crude pipeline from the North Sea port of Wilhelmshaven to Cologne. Several American firms submitted construction bids on the line, to be built in two sections.

Construction is to start early next year with completion due in November. The line will have initial capacity of 112,000 bbl. daily and will serve refineries in the industrial Ruhr area. Throughput by 1975 is expected to be 440,000 bbl. daily. North-West Oil Pipeline is owned by subsidiaries of Standard Oil Co. (N. J.) and British Petroleum Co., Ltd., and four German-controlled firms.

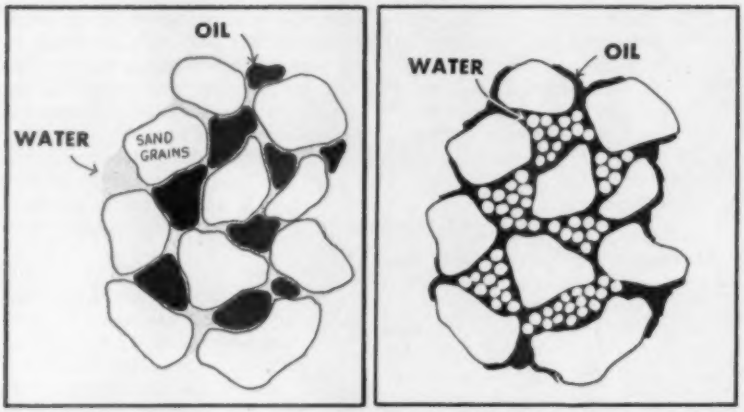
Also for Pipeliners . . .

IN THE NEWS: Canadians gain control of Trans-Canada Pipe Line when T.G.T. and Hudson's Bay sell their stock (p.80) . . . More gas will go to steam generators as California utilities settle gas feud (p.80) . . . Kerr-McGee buys Gulf's Oklahoma gathering lines (p.86) . . . Senator O'Mahoney aims new blast at crude pipelines (p.96) . . . New portable caisson will repair underwater pipelines (p.98) . . . Pipeline expansions are budgeted in $140-million spending in Iran (p.102) . . . First tanker lifting due from new Barinas crude line (p.103).

PLUS THESE TECHNICAL REPORTS: A new device for launching pipe in offshore operations (p.154) . . . Cooling system maintenance for pipelining (p.163).

Here's a new way to shut off water . . .

Before . . . After . . .



WESTERN'S "Selective Water Seal" technique squeezes treated oil into the formation. Before treatment, pore walls are water wet (left diagram). Surfactant makes the rocks oil wet. Squeeze fluid creates a water-in-oil emulsion which acts as a barrier when flow is reversed (right diagram).

Water Barrier Boosts Output

MIDLAND, Tex.—A service company here has what it expects will be a big help in shutting off produced water in oil wells.

Western Co. has tried its new chemical process in some 30 wells, mostly in West Texas, and reports success in a gratifying number of cases. In these cases, Western says, oil production has often gone up, lifting costs have gone down, and water disposal has become less of a problem.

Western calls the technique "Selective Water-Seal." It consists of squeezing a treated oil into the pore spaces of the producing formation. In a water-laden zone, the squeeze fluid creates a water-in-oil emulsion that is a barrier to further movement of water. Western says that no emulsion is set up in the oil zone so that there is no barrier there.

The company reports it has successfully blocked water in wells where water was coning or fingering, where it was channeling behind cement, and where the well had been fractured to water.

Western believes that the process will work in most wells producing water from intergranular or intercrystalline-type porosity. It doesn't believe, however, that the process will work in formations with large channels (reef-type porosity) or those which produce connate water.

A big advantage claimed for the process is that it doesn't require exact location of the zone of water entry.

Uses surfactant . . . "Selective Water-Seal" uses an oil to which is added surfactant to make the rock oil-wet. To inject this fluid into the formation, a packer is set immediately above the top of the producing interval. The treated oil is squeezed in at a pressure too low to cause fracturing. Overflush oil follows so that the treated oil is displaced some distance back into the formation.

After the squeeze, a small amount of fluid is swabbed out of the well so that the formation fluids are drawn back into the squeeze zone. At this point, the chemicals in the treated oil emulsify the returning water into the oil. The company compares action of the emulsion droplets to ball-check valves which operate at the pore constriction and prevent water movement.

Western says that crude oil is miscible with the treated oil. As a result no block is set up in zones producing oil. Thus, the company claims, oil may be selectively produced while the water is selectively b'ocked.

If pores of the rock are too large for the "ball-check-valve" action to operate the firm doesn't expect good results. Conversely, the company says, the smaller the pores in the rock, the more effective the block will be.

Duration of treatment . . . The water shutoff treatment has worked successfully for more than 7 months in one San Andres well in Crockett County, Texas.

Before treatment, the well made 290 bbl. of water and 10 bbl. of oil per day. Immediately after, oil production rose to 30 bbl. and water dropped to 70 bbl. per day. Recently, the well was still making 20 bbl. of oil and only 60 bbl. of water.

While this well shows lasting results, there's no way to tell just how long the emulsion will remain stable in the formation. Western doesn't make any guarantees past 6 months.

For that reason, the company is also trying out a treatment with a chemical that will "set up" over a period of time, thus making a permanent block. The new technique would still depend on the emulsion to set up the initial block until the chemical had time to set up.

Limitation . . . The process can't work in a well with too little oil to make a continuous oil phase, Western reports.

As an example, a 5,000-ft. Delaware sand well in Ward County, Texas, was making over 100 bbl. of water per day and less than 2 per cent oil. Maximum oil saturation apparently was less than 50 per cent.

After being treated, the well flowed 90 M.c.f. of gas per day with a trace of oil and no water. The well remained dry until plugged and abandoned 6 weeks later. As there was no continuous oil phase in this well, both water and oil were blocked.

Gas wells not producing oil have not responded to the treatment.

Monopoly Charged

Senator suggests pipeline divorcement proceedings

WASHINGTON.—The congressional heat is being turned up under oil pipelines.

A not-too-veiled suggestion that the Justice Department consider divorcement proceedings which would separate pipelines from other segments of the industry came last week from Sen. Joseph C. O'Mahoney of Wyoming.

The chairman of the Senate group which probed the Suez oil lift last winter got into the pipeline ruckus, while Rep. Emanuel Celler of New York wound up hearings on compliance with the 1941 Elkins Act consent decree (OGJ, Oct. 28, p. 66).

O'Mahoney said he was "very gratified" over the full-dress FBI investigation started by antitrust chief Victor R. Hansen. But he said the inquiry doesn't go far enough.

Hansen will be asked to extend the probe beyond jointly owned pipelines

and to cover practices of pipeline prorationing, refusal to connect wells, and other alleged discriminations against independent producers.

O'Mahoney said that "the danger of unlawful monopolization, with the power to discriminate against independent producers and refiners, is just as real whether the pipelines of this country are owned jointly or singly."

The recent Supreme Court decision ordering Du Pont to dispose of stock in General Motors which it had held for many years provides a basis for divorcement action against the pipelines, the Wyoming senator declared. He plans to ask the department whether it is going to study oil company stock holdings in pipelines to see if there is any violation of the Clayton Act.

"I think it is obvious that when producers are denied pipeline transportation to markets available to others, there is a prima facie indication of monopolistic practices," O'Mahoney said.

Conoco Researcher Wins

JACK J. REYNOLDS, head of production research at Continental Oil Co.'s research laboratories, Ponca City, Okla., has won a free trip to Bermuda in the Worthington Water-Flood Pump contest.

REYNOLDS

The competition required contestants to rate features of the Worthington pump. The first prize 7-day Bermuda vacation, consists of air transportation, six nights at the Castle Harbor hotel, meals, and tours for two persons. P. J. Dorris, Bartlesville, Okla., won a radial saw workshop as second prize, and C. R. McTee, Tidewater Oil Co., Lafayette, La., won a high-fidelity phonograph for third prize.

Other prize winners: J. Bayless, Houston, Tex., fourth; A. A. Marozas, Standard Oil Co. (Ind.), Casper, Wyo., fifth; A. B. Milam, Walla Walla, Wash., sixth; S. A. Johansson, New York, seventh; R. J. Kallal, Orange, Tex., eighth; F. J. Toth, Denver, ninth; and M. G. Douglass, Waynesboro, Miss., tenth.

Details of the contest, sponsored by Worthington Corp., Harrison, N. J., were carried in advertisements appearing in the June 3, July 1, and August 5 issues of The Oil and Gas Journal.

Processing briefs

Standard Oil Co. (Ind.) awarded a contract to Arthur G. McKee Co. for the world's largest crude distillation unit. The 140,000-bbl.-per-day unit will be built at Standard's Whiting refinery and will replace a number of small, obsolete units. Completion is scheduled for 1959. The largest distillation unit now in operation is located at Tidewater Oil Co.'s New Delaware refinery. Its capacity is 130,000 bbl. per day.

Commonwealth Oil Refining Co., Inc., is now operating newly expanded facilities at its Ponce refinery on Guayanilla Bay in Puerto Rico. Now on stream are a 35,280-bbl. crude unit, a 26,800-bbl. Houdriflow catalytic cracker, a 3,730-bbl. Houdriformer, and a 1,470-bbl. catalytic polymerization unit. Crude runs have been boosted to more than 50,000 bbl.

Commonwealth stockholders will vote November 15 on a proposed $25-million financing program for the new expansion and for facilities yet to be added. About $2 million of the total will go for a new visbreaker and catalytic hydrogen treating facilities for the Ponce refinery and the remainder for the current expansion, which duplicates the original refinery.

Monsanto Chemical Co. will erect a urea plant at El Dorado, Ark., with a capacity of 100 tons per day. The plant is expected to be on stream by early next fall. It will produce urea in both prill and solution forms and will allow Monsanto to expand its fertilizer market.

Carter Oil Co. is expanding its 24,-500-bbl. refinery at Billings, Mont. The company will add another 9,500 bbl. to capacity of the plant by modifying present distillation facilities. No new units are planned. Completion of the program is scheduled next spring.

The 8-year-old plant is Carter's only refinery. The firm recently expanded its marketing territory to include the Pacific Northwest. Prior to that, principal sales outlet was the Rocky Mountain area. The refinery is the site of the world's first fluid coker, a 3,800-bbl. unit which went on stream in 1955.

Frontier Refining Co. has expanded the capacity of its Cheyenne refinery from 16,500 to 22,000 bbl. daily by adding a thermal unit to the topping and cracking units. Frontier also doubled capacity to 10,000 bbl. daily at the refinery's asphalt plant by installing a barometric condenser. The improvements cost about $300,000.

Davison Chemical Co. has post-poned indefinitely construction of a $2-million sulfuric acid plant at Casper, Wyo. It was one of two plants, each with a capacity of 200 tons a day, scheduled to serve Wyoming oil, chemical, and uranium mining industries. Platte Chemical Co., Salt Lake City, is going ahead with plans for construction of the other plant and last week purchased land east of Casper as a site for the $2½-million facility.

Commercial Solvents Corp. has ex-panded synthetic methanol purification facilities at Sterlington, La. The company produces pure synthetic methanol from natural gas and air and refines the crude methanol by special distillation techniques. No chemical treatment is involved.

New facilities were engineered by Badger Manufacturing Co. of Cambridge, Mass., which installed its own new process for producing extra high purity methanol. The unit is the first of three methanol projects being hand'ed by Badger to go on stream.

Also for Refiners . . .

IN THE NEWS: Changes in highway program may affect asphalt market (p.77) . . . ODM plans to keep a check on residual imports (p.81) . . . I.P.A.A. again endorses voluntary imports control plan (p.82) . . . Carson reveals in an exclusive interview how imports will be controlled during the months ahead (p.84) . . . Union Carb'de comes up with a new polymer discovery which opens door to new field in petrochemistry (p.88) . . . Creole puts new crude unit on stream at Amuay Bay refinery (p.104).

PLUS THESE TECHNICAL REPORTS: Pulverized coke fires clean in its first refinery use (p.142) . . . New method gives small plants a cheap way to remove sulfur from H_2S (p.144).

Bill Law operates his model caisson. It's a . . .

Device to Fix Undersea Pipe

SHREVEPORT, La.—A portable caisson is being built to repair submerged pipelines and thus eliminate the costly, and sometimes damaging, practice of lifting pipelines to the surface.

The caisson also can be adapted to make side connections to underwater lines while still in place.

Only a model of the device has been constructed so far, but Interstate Oil Pipe Line Co. is preparing to build and test a full-sized unit. Bill Law, mechanical consultant in Interstate's engineering department, designed the model.

Law's design (see photo) has two attached sections. The lower section, about 7 ft. in diameter, acts as a large cylindrical "jaw" that opens and slips around the pipe. When clamped shut, it is watertight and serves as a cylinder for pipe passing through it.

The lower section is hinged internally to an upper cylindrical section about 5 ft. in diameter. A nylon-neoprene sleeve serves as a watertight seal between the two sections.

Two hydraulic pistons, attached to the outside of the upper section, operate the lower "jaw."

When the caisson is pumped free of water, repair crews climb down to a platform in the lower section to do the repair work. Welding fumes are exhausted and fresh air added. Iron weights are added to prevent the caisson from rising when water is pumped out.

Special fittings are provided for jobs requiring a side connection.

Extensions may be added to the upper section to allow operations in water 50 ft. deep.

U.O.P. Hearings Begin

NEW YORK.—Guaranty Trust Co. began last week to tell Referee Louis M. Loeb why the sale of Universal Oil Products Co. stock is in the public interest and why Guaranty's commission of 10 per cent is justified.

The opening hearing before Leob, representing the New York State Supreme Court, disclosed for the first time that U.O.P.'s net worth grew from less than $3 million in 1944 to more than $23 million in 1956 and its net income from $2.4 million to $6.7 million.

The New York Attorney General's office argued at the hearing that charitable beneficiaries represented by him do not question the soundness of the proposed sale but want assurance that the price will be proper. Also the state argued that Guaranty's fee of $50,000 per year for handling the U.O.P. account is "grossly excessive."

Huge Shale Beds

. . . revealed in new studies by Department of Interior

WASHINGTON.—A square mile of oil-shale reserves in Colorado's Piceance Creek basin may produce as much as 2.25 billion barrels of oil. That's the latest indication by the Bureau of Mines.

If further studies support this finding, the 1,400 sq. miles of the Green River shale formation in Colorado may have a potential 30 per cent greater than the 959-billion barrel estimate of the Interior Department last spring.

The Colorado studies cover only part of this great formation. It extends into Wyoming and Utah. However, the shale area in those states has never been charted.

The greater richness and thickness of the reserves was discovered during research at the Bureau of Mines station at Laramie, Wyo.

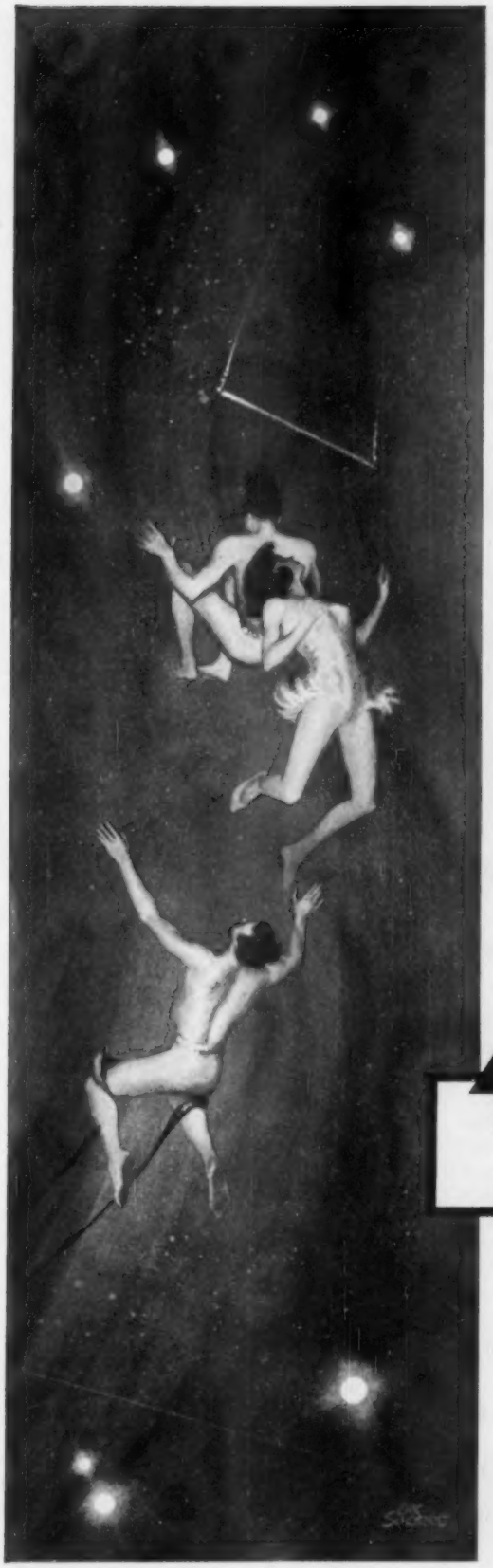
New estimates, which will be made when the bureau completes its studies, started with analyses of drill cuttings from 11 oil and gas wells drilled by four companies in the Piceance Creek basin.

While less reliable than drill cores for making estimates, cuttings can be considered a reasonable gage of shale richness, bureau experts say.

The cuttings secured from the wells of Carter Oil Co., Equity Oil Co., General Petroleum Corp. and Ohio Oil Co. indicate that the shale beds are from 780 to 1,980 ft. thick. Top of the beds ranges from 505 to 1,770 ft. below the surface.

The oil content averages 25 gal. per ton, based on assays only of shales giving 15 gal. or more per ton.

Final proof of the bureau's findings and determination of the feasibility of open-pit mining will require more detailed studies. These will include further probing of the geology of the area, extensive core drilling, and core analyses.



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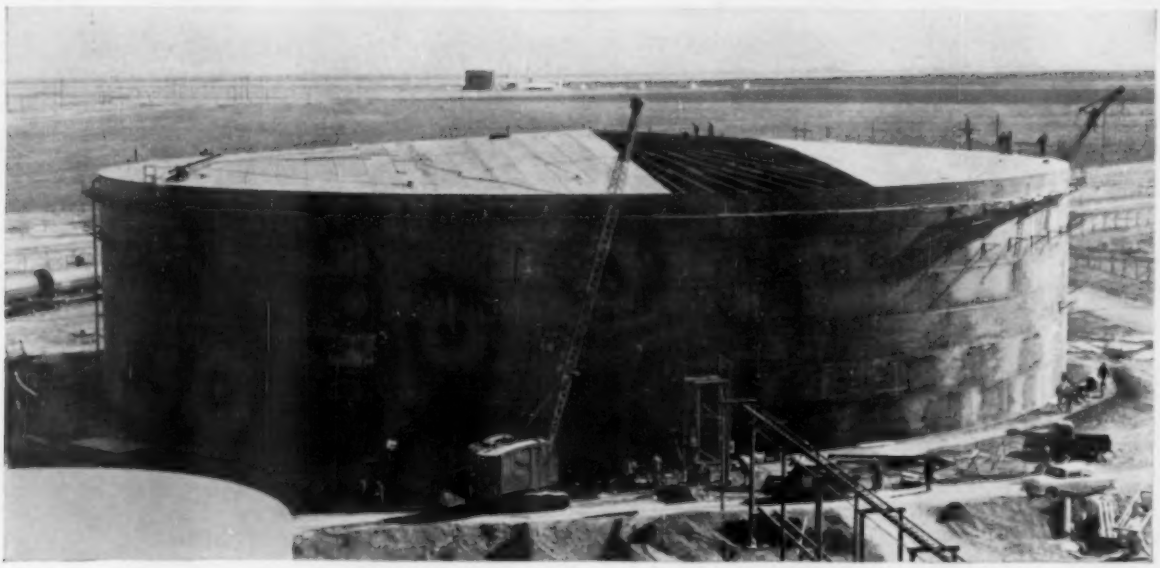

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You could discharge the loaded capacity of a train of tank cars over 12½ miles long into Phillips Chemical Company's huge storage tank at Cactus, Texas. With a diameter of 220 feet and a height of 48 feet, this new tank is the largest in the world used for liquid storage. Liquid is pumped in at a rate of about 250 gallons a minute . . . and yet it takes nearly 37 days to fill this 323,000-barrel-capacity tank.

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World Production Slips

. . . with Venezuela taking biggest tumble. Middle East and U. S. also dip, while Caltex makes big Sumatra gain

THE SUMMER SLUMP in free-world crude production extended into its second month in August.

Most of the big exporters and the United States showed declines. One difference in August was that Venezuela rather than the U. S. bore the brunt of the reduction.

In Venezuela most of the August cutback was absorbed by the two largest producers—Creole Petroleum Corp. and Cia. Shell de Venezuela. These same two companies had the lion's share of the gains during the Suez Canal shutdown.

Creole was off 47,300 bbl. daily in August to 1,157,100 bbl. daily. Shell was down 51,300 bbl. to 861,100 bbl. per day.

Among other producers, Mene Grande Oil Co. was off 23 400 bbl. to 389,500 bbl. daily. Socony Mobil Oil Co., Inc., was down 23,400 bbl. to 106,700 bbl. daily. Most other producers held fairly steady. Atlantic Refining Co. added 2,900 bbl. for 26,800 bbl. daily.

Sumatra a comer . . . Caltex, the smallest producer in Indonesia until 2 years ago, produced as much crude as Standard-Vacuum Oil Co. and Royal Dutch-Shell combined in August.

Crude-Oil Production Over the World

(Daily average in thousands of barrels)

Country—	August 1957	July 1957	August 1956
Western Hemisphere:			
Argentina	89.7	89.7	81.2
Bolivia	9.6	9.6	8.8
Brazil	30.0	26.6	10.4
Canada	506.0	540.3	518.2
Chile	11.9	11.8	10.2
Colombia	127.1	124.0	123.2
Cuba	1.0	1.1	1.7
Ecuador	7.7	7.7	9.3
Mexico	240.0	240.0	251.6
Peru	52.8	52.8	50.3
Trinidad	95.3	95.1	79.0
Venezuela	2,751.5	2,877.5	2,465.5
Total	3,922.6	4,076.2	3,609.4
W. Europe & Africa:			
Algeria	0.3	0.3	0.5
F. Morocco	1.5	1.5	1.9
Egypt	45.8	52.3	41.7
Gabon	4.0	4.0	
Austria	57.7	59.1	65.6
France	26.7	27.8	24.5
West Germany	78.6	77.7	69.7
Italy	27.5	25.9	11.3
Netherlands	30.9	30.4	21.0
Turkey	6.5	6.5	5.4
United Kingdom	1.6	1.6	1.3
Yugoslavia	7.7	7.6	5.8
Total	288.8	294.7	248.7
Middle East:			
Bahrain	34.1	32.5	30.1
Iran*	767.0	760.0	543.0
Iraq†	493.0	464.2	753.1
Israel	1.2	1.2	0.7
Kuwait	1,286.0	1,288.0	1,180.5
Neutral Zone	75.0	75.0	39.2
Qatar	148.0	158.7	127.8
Saudi Arabia	1,152.1	1,209.8	1,005.9
Total	3,956.4	3,989.4	3,680.3
Other Asia:			
British Borneo	118.0	118.0	116.8
Burma	5.0	5.0	4.8
India	8.5	8.5	9.2
Indonesia	328.0	315.0	257.7
Japan	6.1	6.1	6.0
New Guinea	6.2	5.9	7.2
Pakistan	5.9	5.9	5.8
Total	477.7	464.4	407.5
Free World:			
Foreign	8,645.5	8,824.7	7,945.9
United States	6,786.0	6,873.0	7,195.0
Total	15,431.5	15,697.7	15,140.9
Communist countries in Soviet orbit:			
Romania	220.0	220.0	218.0
Russia	1,975.0	1,950.0	1,600.0
Others	50.0	50.0	50.0
Total	2,245.0	2,220.0	1,868.0
World total	17,676.5	17,917.7	17,008.9

*Includes 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

†Includes estimated 5,000 bbl. daily from Naft Khaneh field, operated by British Petroleum Co.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made for those countries, particularly in Southeast Asia, where complete reports are lacking.

TREND OVER THE LAST YEAR

1956—	Western Hemisphere less U.S.	Middle East	Total, Free World outside U.S.
August	3,609.4	3,680.3	7,945.9
September	3,637.2	3,721.8	8,019.3
October	3,688.3	3,873.5	8,251.8
November	3,760.8	2,152.8	6,544.2
December	3,915.9	2,428.9	6,989.7
1957—			
January	3,993.9	2,645.7	7,301.7
February	4,040.7	2,855.5	7,561.6
March	4,117.8	2,764.3	7,582.0
April	4,111.5	3,140.0	7,985.0
May	4,116.0	3,556.1	8,407.3
June	4,160.6	3,957.3	8,872.5
July	4,076.2	3,989.4	8,824.7
August	3,922.6	3,956.4	8,645.5

The company produced a record high of 166,900 bbl. daily. This was up 81 per cent over a year ago and reflects progress in a major development program now under way.

Caltex this spring opened a 16-mile, 18-in. pipeline from Minas field to its terminal on Siak River. The line parallels the original 12-in. line. The fleet of river tankers for the run to Pakning ocean terminal also was doubled, from six to twelve.

Two more fields, Bekasap and Duri, are under development northeast of Minas. A 30-in. line will carry this production to a new ocean terminal at Dumai.

The Stanvac subsidiary averaged 59,000 bbl. daily. Of this, 57,500 bbl. daily came from Central Sumatra. South Sumatra, where the last development well will be drilled this year, produced 1,500 bbl. daily. Shell produced about 100,000 bbl. daily.

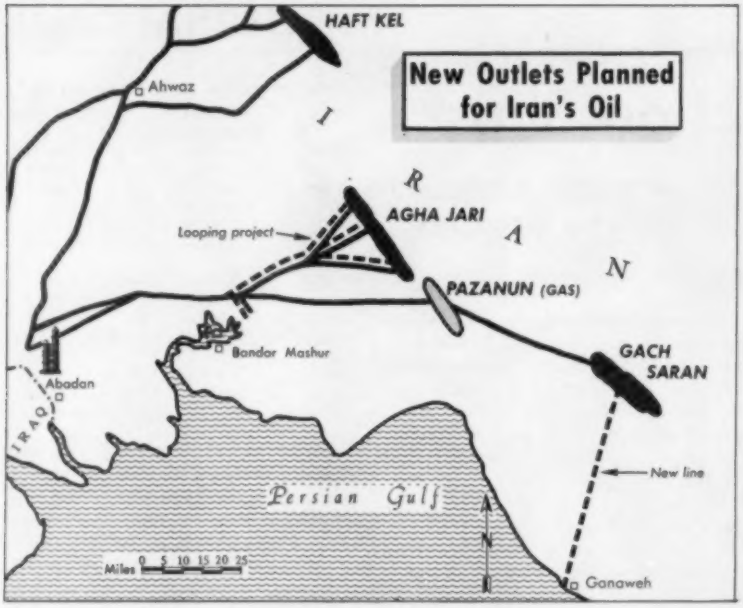
Brazil gains . . . Petroleo Brasileiro, S. A., had its best month with 30,000 bbl. daily from Bahia fields.

The state-owned oil corporation completed seven wells, spudded nine, and had 27 under way. The completions included five oil producers, one dry hole, and one stratigraphic test.

Petrobras has calculated reserves in Bahia at 346,000,000 bbl. on the basis of its work in the area. This is more than six times the reserves estimated by its predecessor, Conselho Nacional do Petroleo.

New Sinai field . . . Oriental Oil Co., the new company owned by Egypt, E.N.I., Petrofina, and other interests, opened Rudeis field to commercial production during August. It averaged 1,800 bbl. daily from two wells. A third was drilling.

Rudeis is on Sinai Peninsula near the Red Sea Coast. It is on the same concession block as Belayim and Feiran fields. Belayim produced 14,500 bbl. daily during the month, and Feiran, 500 bbl. daily.



Big Spending in Iran

● Consortium's output will hit new records as result of $140-million budget next year. Much of the money will go into Gach Saran (see map), a field that may have world's biggest reserves.

SINCE Italy's Enrico Mattei offered Iran what has become popularly known as a 75-25 profit split for new oil concessions, private companies the world over have wondered just a little uneasily what the effect will be.

Mattei's much publicized deal has gotten a lot of attention, in both public and private, both from the industry and from oil-producing countries. The wily Italian hails it as a coup. He thinks it's going to bring oil to Italy. He also thinks the terms of the deal will make him a power to be reckoned with in international oil.

He plans to spend $6 million in the next 4 years in Iran and another $16 million in the following 8 years —a total of $22 million looking for oil.

Last week the private oil companies operating Iran's producing fields unveiled plans that make Mattei's project look puny.

They are going to spend $140 million in the next year. The money will go for projects that will send the country's oil production zooming upward. As the production goes up, so will the income Iran gets from oil.

Here are some of the projects included:

...**A 50-mile,** 26 and 28-in. crude pipeline from Gach Saran field to a new terminal on the Persian Gulf.

...**A new loading port** in the Ganaweh area which will handle tankers up to 100,000 tons.

...**Thirty miles** of 20-in. crude line and 22½ miles of 16-in. crude line looping for the system which moves Agha Jari crude to the loading port at Bandar Mashur.

...**Two more drilling** rigs for a stepped up program of both exploration and development drilling.

...**More geological** and geophysical parties for work throughout the consortium's concession area in southwest Iran.

...**Thirty million** dollars in housing and welfare programs for Iranian workers employed by the two operating companies. These plans include the building of 1,320 new houses.

...**Three million** dollars worth of new medical facilities for Iranian workers. This cost will be shared by the consortium's operating companies and National Iranian Oil Co., the government's oil company.

Gach Saran . . . Iran's southernmost field was discovered at Gach Saran nearly 30 years ago. It has been idle most of that time. The field is the shallowest in Iran and some geologists believe it has the biggest crude reserve in Iran, possibly the world.

It has been held "in reserve" all these years because of the high sulfur content of its 31.8°-gravity crude. There was no real demand for the sour crude and as long as better crudes were produced in other fields it was left alone. The sharp increase in European demand for heavy fuel is changing all this.

Until little more than a year ago, there were only four wells as Gach Saran. Three of them were shut in and the fourth produced less than 400 bbl. daily. Eight more wells have been drilled and a second rig is going to move into the field for an even more intensive development program.

The first 6 months of this year the field produced an average of 43,000 bbl. daily. This output will rise sharply as the additional wells are drilled and the pipeline built.

The consortium's exploration and producing company plans to build several 150,000 bbl. daily separation units and sulfur-extraction units in the field to process the crude before it enters the new pipeline.

A final route for the pipeline and site for the big new loading terminal have not yet been selected, but the line will move south and west from Gach Saran to the Persian Gulf somewhere in the Ganaweh area. It is roughly a distance of 50 miles.

The consortium has put a $53-million price tag on the work it plans for Gach Saran's new facilities.

Agha Jari . . . The existing pipeline system linking Agha Jari, Iran's principal producing oil field, and the crude loading port at Bandar Mashur is 20 and 22-in. pipe. This system moves Agha Jari's 430,000 bbl. daily.

It is being supplemented with 30½ miles of 20-in. and 22½ miles of 16-in. pipe to keep pace with the field's steadily rising production. With the additional pipeline capacity and the newly constructed tanker jetties at Bandar Mashur, production from this field will continue to go up.

The exploration and producing company now has two rigs drilling at Agha Jari. Earlier this year one of those rigs brought in a 20,000 bbl. daily well 6 miles northwest of the then known limits of the field.

The pipeline looping project and a fourth gas-separation unit for the field will boost its productive capacity to 600,000 bbl. daily from only 24 wells.

Japanese Oil Plan Is Sagging

Promotion to grab Middle East concession is losing steam for lack of cash. New demands made by Saudi Arabia

THE AMBITIOUS plans of the Japanese to buy a piece of Middle East oil appear to be foundering.

Promoters of Arabia Oil Co. are faced with waning enthusiasm on the part of their Japanese financial backers, and Saudi Arabia is increasing its demands for cash.

The group is asking Saudi Arabia for an offshore concession in the Persian Gulf in an area that is certain to be claimed also by Kuwait. Just how this problem would be solved has never been explained by the Japanese.

Shotaro Suginamori, who has been active in the negotiations, faced his shareholders in Tokyo last week with what was a cross between a plea and an ultimatum. He asked that they put up promised capital within a week.

Representatives of about 50 Japanese firms who once agreed to back the venture left the meeting without committing themselves.

Cash not there . . . The new oil company was to be started with $10 million in capital.

Last week the backers of the venture had actually put up only about $700,000. They blamed the tight-money situation in Japan. Some admit privately they are beginning to question the wisdom of the venture.

Suginamori declined to divulge the details of his deal with Saudi Arabia other than that the Saudis are now asking for more than when the talks started last summer.

The Japanese originally offered Saudi Arabia a cash bonus of about $5 million for the concession. Now the Saudis want the bonus offer increased, plus an annual $3-million payment during the exploration period. The proposed deal would call for a 55-45 profit split in favor of Saudi Arabia.

The venture has been promoted largely by Taro Yamashita, chairman of Japan Petroleum Trading Co., a small marketing firm. None of Japan's big refining companies nor any of her producing companies is involved.

Barinas Crude Moves to Port

A VALVE will turn this month and a T-2 tanker alongside a new loading pier at El Palito will begin filling with Barinas crude.

The first tanker lifting, slated for November 21, will climax a year-long pipeline construction program aimed at opening Venezuela's third major producing area.

Socony Mobil Oil Co. de Venezuela and Sinclair Oil & Refining Co. will share the honors of the occasion.

The two companies have developed the Barinas basin production. They built the 211-mile, 20-in. pipeline in a joint venture, and they put up the $26 million it cost.

The pipeline itself was built in less than a year. First pipe was laid just a year ago this week. The actual moving of Barinas crude from the Caribbean shipping port had to wait until the loading facilities were completed.

A rich area . . . Socony, which will operate the pipeline system as the major partner in the venture, first discovered oil in the remote Barinas-Apure basin in 1947. The company drilled six wells, but because of the distance to tidewater did not pursue the development intensively.

In 1953 Sinclair's Sinco discovery on an adjacent concession focused new attention on the southwestern Venezuela basin. Sinclair now has 33 wells in its Barinas field with two rigs at work on development. Socony has 21 producers at Silvestre, the discovery field, and two more at nearby Silvan field. The company has two development rigs at work. Another is being used for wildcatting.

Sinclair's original Sinco wells tested from 1,300 to 1,600 bbl. daily from three sands, the deepest at 8,986 ft. The crude is 25°-27° gravity. Early in 1955 when the company had drilled less than 10 wells, Sinclair estimated reserves for its 11,000-acre concession at 66,000,000 bbl.

Socony has never revealed similar data for its Silvestre and Silvan fields, but the two productive areas are adjacent and will produce from the same sands.

The pipeline . . . The 20-in. pipeline will move from 40,000 to 60,000 bbl. daily of crude initially for the two companies with one pump station at Silvestre.

The station is powered by three V-type, 16-cylinder, turbocharged, dual-fuel engines operating on crude from the line as fuel. The engines will drive two-stage, 12-by-12 centrifugal pumps.

Initial capacity of the line will be 100,000 bbl. daily. When production reaches this stage, capacity can be increased to 150,000 bbl. daily by adding a booster station.

The terminal of the line at El Palito, about 7 miles west of Puerto Cabello, has five 267,500-bbl. floating-roof tanks on a bluff 260 ft. above the shore. This will allow gravity loading of tankers through the 30-in. and main loading line to the 1,800-ft. pier. Maximum loading rate will be 30,000 bbl. an hour.

Cuban Test Ready

Island is built offshore for Cuban Stanolind rig

CUBAN STANOLIND OIL CO. has built an island some 19 miles off the south central coast of Cuba and is preparing to spud its first wildcat in the offshore area before the end of November.

Details of the drilling program have not been fully disclosed, but a spokesman for Pan American Petroleum Corp., parent company of Cuban Stanolind, said last week the first well on the artificial island will be designated 1 Tortugas Shoals.

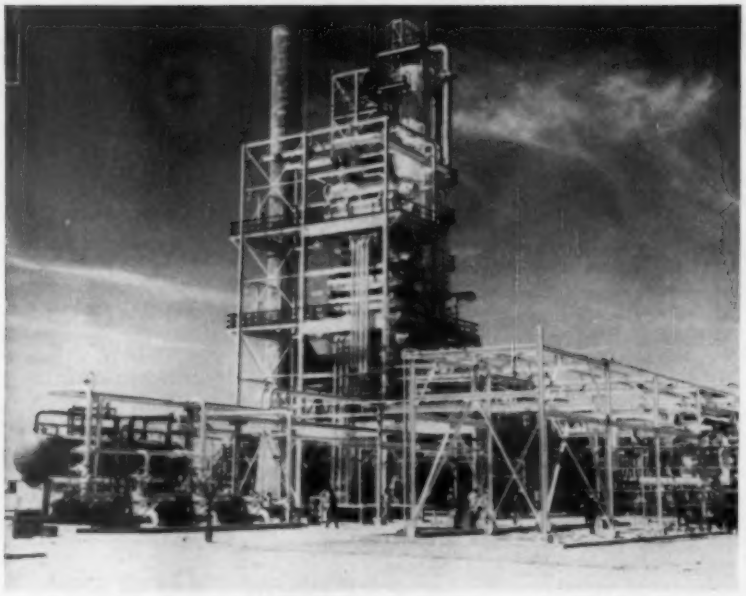
When the dry season in Cuba arrives after the first of the year, the company also plans to drill two or three onshore locations in a 15,000,000-acre concession on which it has a farmout arrangement. The same concession includes the offshore location.

A Cuban Stanolind rig capable of going to 10,000 ft. is being moved from Jamaica to the island. The test is budgeted for 9,000 ft. The island was built up from shoals in 7 to 12 ft. of water.

The well is the first offshore test for south Cuba and represents the beginning of an intensive drilling exploration campaign on the big concession by Cuban Stanolind for Cuban Venezuelan Oil Voting Trust, a stock firm owned by Cuban nationals and others.

Cuban Stanolind, under its agreement with C.V.O.V.T., will earn an interest in any production developed.

The American firm has done extensive geophysical work in the concession.



This new unit produces light naphtha and fuel oil as . . .

Creole Boosts Refinery Output

A NEW 104,000-bbl. daily crude distillation unit went on stream last week at Creole Petroleum Co.'s refinery at Amuay Bay in Venezuela.

The new unit, the refinery's fourth distillation plant, increases Amuay's basic crude capacity to 328,000 bbl. daily.

The new pipe still was built by Foster Wheeler Corp. It will process heavy crudes from Bachaquero fie d to produce light naphtha and fuel oil.

The increased refinery throughput which the new distillation unit gives Creole indicates the company is now refining well over 30 per cent of the crude it produces. The Venezuelan Government at one time insisted that producers refine at least 10 per cent of their oil in the country but last year increased this figure to 15 per cent.

France Delays Sahara Decision

IF THE 11 groups who applied for Sahara Desert oil acreage in September are eager to get to work, France's official Bureau de Recherche de Petrole dashed those hopes last week.

B.R.P. said in Paris it will be several months before the acreage is parceled out.

The delay apparently isn't bothering one group with American capital. Sinclair Oil Corp. announced last week in Paris it will be the operator for a group applying for some of the 23,000 sq. miles which is open.

Sinclair has a 27 per cent interest and Newmont Mining Co. has 18 per cent of a five-company combine. The three French partners are Ste. Francaise de Recherches et d'Exploitation du Petrole, a subsidiary of B.R.P.; Messrs. Lazard et Cie., Paris banking firm; and l'Omnium de Valeurs Agricoles Industriales et Minieres.

In no hurry . . . The French Government oil bureau said that all 11 applicants for the acreage have met basic requirements and are qualified for acreage. The bureau, however, discounted reports that the awards would be made soon.

The 5-year license held by two wholly French companies surrendering the acreage expired officially last week.

P. C. Spencer, Sinclair president, said in Paris last week his company is optimistic about prospects in the Sahara—in spite of the fact that Sinclair hasn't officially been awarded any acreage yet. Spencer's confidence that his company will get an award is undoubtedly justified since B.R.P. is a partner in his venture.

Spencer said his company's geologic reports "are most encouraging." He added that Sinclair is well aware of problems involved in exploring the desolate desert and the "important transportation problems that must be solved" if production is found.

He pointed out that once the oil reaches the Mediterranean it will be much closer to western Europe than Middle East production. He is confident Saharan oil could "compete very favorably" with Persian Gulf crudes.

Superior Hits Again

Third straight strike in Lake Maracaibo reported

SUPERIOR OIL CO. so far has found more oil in its new Lake Maracaibo concessions than anyone else, oldtimers or newcomers, drilling on new blocks.

Last week Superior looked even better.

The company announced in Caracas last week it has found 718 ft. of oil pay at 9,630 ft. in Lama 7, its third well on the 7,774-acre block in the middle of the lake. Superior paid the top bonus of $2,831 an acre for this national reserve tract.

No production or drill-stem tests were revealed, but if thickness of pay is any indication, Lama 7 may be much better than the first two wells, which tested a total of almost 11,000 bbl. daily. The first two wells are now producing 8,100 bbl. daily.

Lama 1, in the northeast corner of the block, tested 3,300 bbl. daily from perforations in 196 ft. of 312 ft. of Eocene pay. Lama 5 tested more than 7,600 bbl. daily from a 134-ft. Eocene pay. Both are producing from between 7,450 and 7,776 ft. (OGJ, Sept. 16, p. 120, and Oct. 7, p. 122).

Superior has shipped two lake tankers (about 25,000 bbl. capacity each) to Mene Grande Oil Co.'s Las Piedras terminal. A third tanker moved its load to Talon Petroleum's La Estacada terminal, where Superior is building its own storage facilities.

Camay to Drill in Algeria

CAMAY DRILLING CO., Los Angeles, and the French firm Cie. Industrielle de Travaux (CITRA) have made a joint-venture agreement for contract drilling in North Africa and other French areas of influence.

The two companies have ordered two new Ideco rigs for development work in the new Hassi Messaoud field of Algeria. Rated for 7,000-11,000-ft. drilling, the first rig is to be shipped about December 1 and the second one early next year.

Camay is a subsidiary of Southern California Petroleum Corp.

How Pipeline Automation helps boost capacity and reduce operating costs

UNION Centralized Transport Control on various oil and gas pipelines has resulted in highly efficient operation and a material increase in pipeline capacity.

Other advantages of UNION C.T.C. are:

1. Less co-mingling of products at the interface because, with UNION C.T.C., fast-acting valves can be used and controlled quickly and accurately.

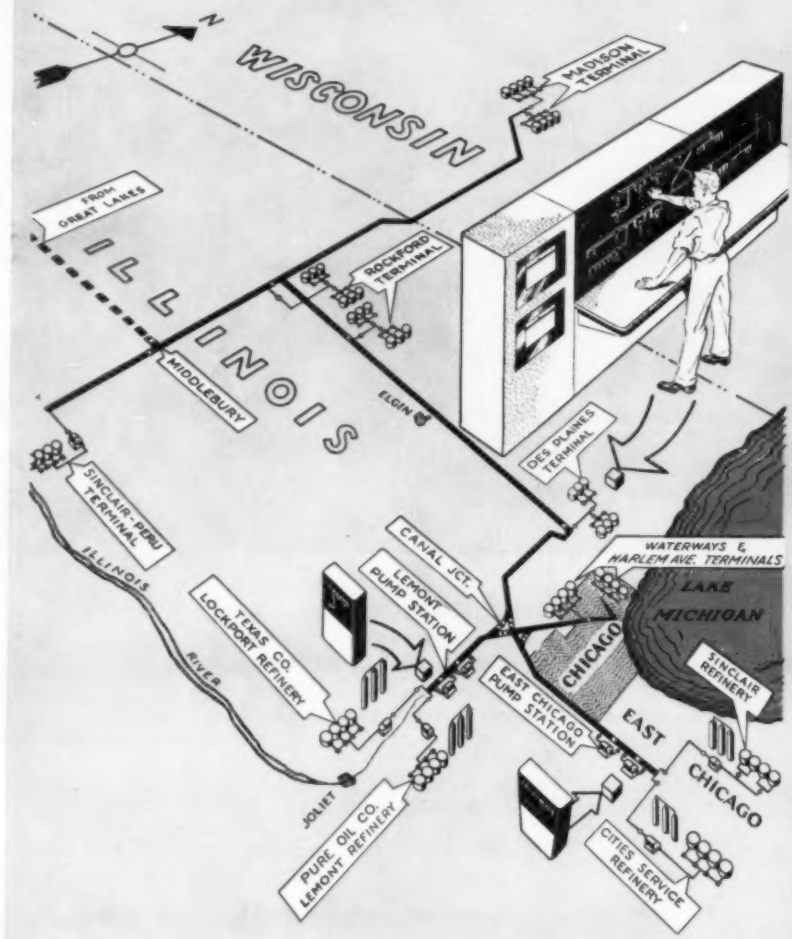
2. No false indications from interface detector because of the accuracy of the message transmitter.

3. Ability to preset movement of products through pipeline eliminates possibility of error.

4. UNION'S C.T.C. System makes it possible to tell when and where trouble is when it occurs.

The installation illustrated was the first of its type and has been in service more than two years. The reliability of the equipment permitted steady operation with little down time and low maintenance.

If you are planning a new pipeline, modernizing an old one, or require control for tank farms or gathering systems, let us show you what UNION Centralized Transport Control can do for you. Write for our latest Bulletin No. 1052.



Over-all plan of Badger Pipeline System. The Des Plaines dispatcher acts as the supervisor of the products flow. All information needed to control the system is contained on the UNION C.T.C. console.

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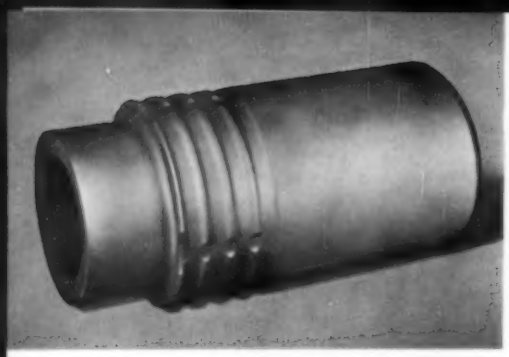
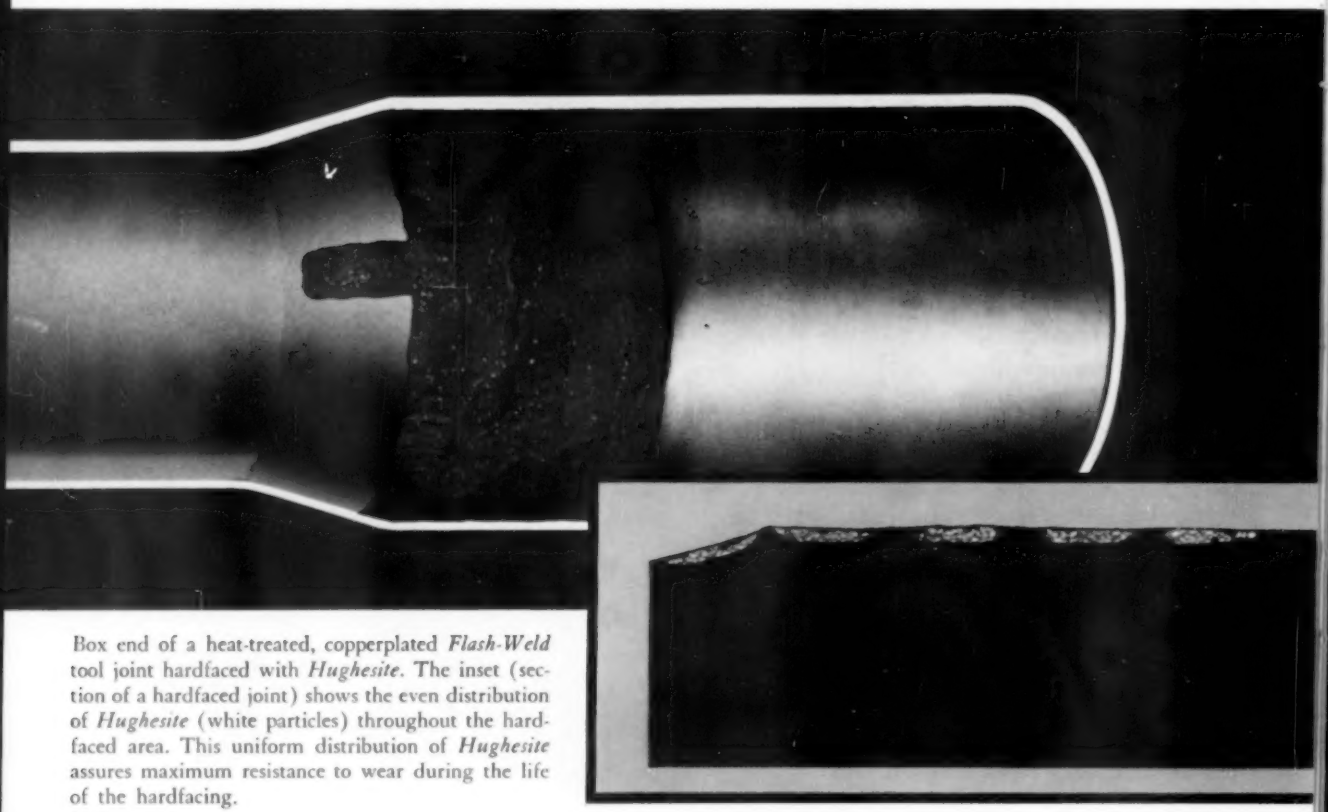


Square shoulder *"Flash - Weld"* tool joint grooved for hardfacing.

why **HUGHES** hardfacing doubles *(often triples)* life of tool joints



Box end of a heat-treated, copperplated *Flash-Weld* tool joint hardfaced with *Hughesite*. The inset (section of a hardfaced joint) shows the even distribution of *Hughesite* (white particles) throughout the hardfaced area. This uniform distribution of *Hughesite* assures maximum resistance to wear during the life of the hardfacing.

When you get a Hughes hardfaced tool joint, you get two things: 1) A basically superior tool joint, 2) A hardfacing material — *"Hughesite"* — 25 times more wear resistant than hardened steel — plus a proved method of application.

Hughes pioneered hardfacing. To get a material that would do the job hardfacing is called upon to perform, we produced our own: developed the specifications for the raw material and perfected the manufacturing process and method of application.

Hughesite is a tungsten carbide alloy many times harder than the hardest mineral formations encountered in oil well drilling.

metallurgical look at HUGHESITE

This color photomicrograph shows a pinpoint section of a *Hughesite* particle, magnified 2000 times. The fine-grained structure — achieved through closely controlled manufacturing — gives *Hughesite* the unique combination of high mineral hardness and toughness. Cross section of a band of hardfacing, magnified three times, is shown at left.

Hughesite is not just another name for a hardfacing material. It is the product of a sequence of closely controlled operations, starting with raw material of the highest purity and ending with the hardest known material that can be successfully used to hardface tool joints.

That is why Hughes hardfacing, year-after-year, has consistently proved to be equivalent to an extra set (and often an extra two sets) of non-hardfaced tool joints . . . and at only a fraction of the cost of replacing them.

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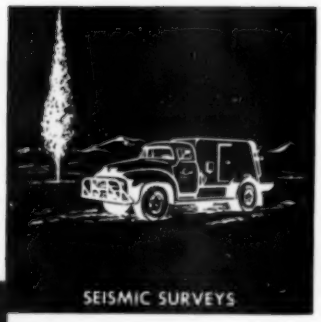
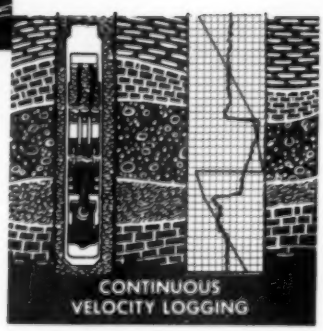

SEISMIC SURVEYS

DATA PROCESSING AND PRESENTATION

GRAVITY SURVEYS

ELECTRONIC POSITIONING

GEOPHYSICAL INSTRUMENTS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THE GULF COASTAL PROVINCE...

how and where its oil and gas occur-

By Grover E. Murray
Louisiana State University

THE Gulf Coastal province is one of of the most important petroleum provinces in the United States, and, for that matter, the world. Oil or gas occurs in rocks of every age from the Paleozoic to the Recent and in shallow fields to the deepest production in the world.

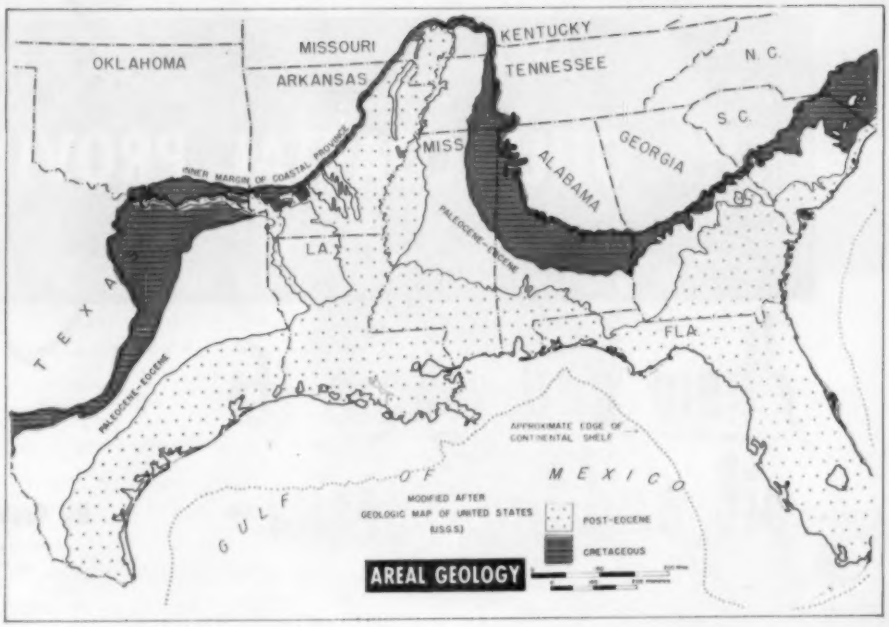
Although small oil fields are numerous in the Gulf Coastal province, the 77 major oil fields will eventually yield approximately two-thirds of the total ultimate production of the province, estimated at 23 billion barrels. (A major oil field is one that will ultimately produce 100 million barrels of oil.)

Production occurs in both arenaceous and carbonate rocks, but the clastic rocks are by far the most important oil-bearing zones, especially the sandstones of Miocene age. Much of the oil production is directly related to structures resulting from the movement of salt, probably the Louann. However, the traps are usually the result of two or more geological factors, involving regional and local structure, stratigraphy, porosity, and permeability.

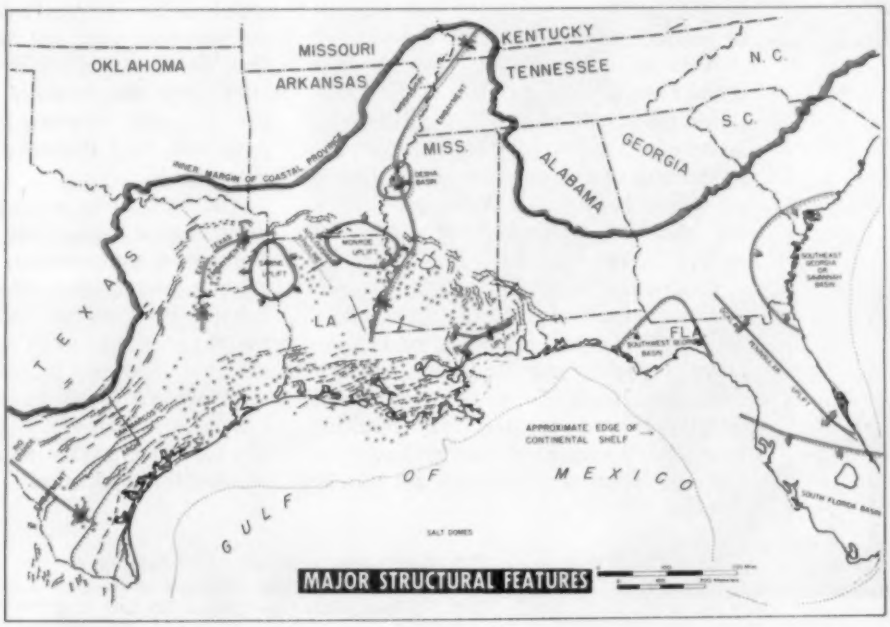
Oil traps run the gamut from simple anticlines to complexly faulted traps on the flanks of large salt domes. Regional fault trends play a major role in trapping oil locally; this is most apparent along the Balcones, Mexia-Talco, Luling, Arkansas, and Pickens-Quitman-Gilbertown trends.

The Gulf Coast geosyncline forms the north coastal flank of the Gulf of Mexico and has a tremendously thick geologic column ranging up to 40,000 ft. of Mesozoic-Cenozoic rocks. Most of the important oil fields occur in areas of 30-50 per cent sand and in areas of structural terracing updip of monoclinal flexing. Changes in porosity and permeability control oil accumulation locally and may account for production.

This paper was originally presented at the International Geological Congress at Mexico City. Subsequently the author revised and updated the data and presented it to the 1957 annual convention of the Gulf Coast Association of Geological Societies at New Orleans. This is an abridged version of the G.C.A.G.S. paper.



THE over-all regional form and shape of the Gulf Coastal province are controlled by Paleozoic and Precambrian structures and alignments. Mesozoic and Cenozoic sediments attain a thickness of 40,000 ft., forming a vast coastal geosyncline. Igneous rocks of Mesozoic age are present locally, especially in southern Arkansas, northern Louisiana, and western Mississippi.



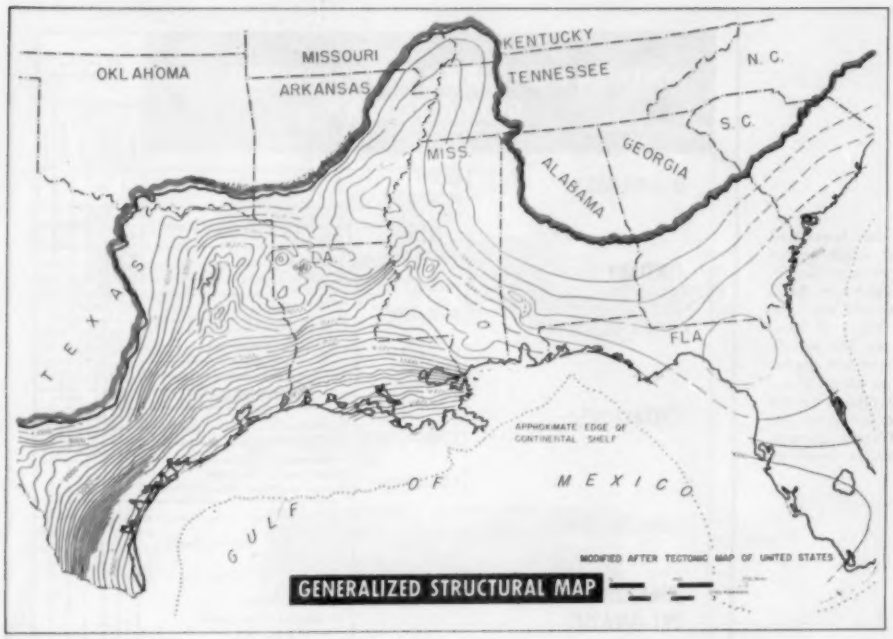
STRUCTURALLY the province is one of vertical movements and most of the local features are related to salt movement. Deposits of the northern gulf coastal element possess an over-all homoclinal dip toward the Gulf of Mexico and constitute a great sedimentary and structural arc from Florida to Mexico. Appreciable alterations of the regional dip result from large positive and negative anomalies.

Several major fault trends, probably the result of salt movement, are regional in extent.

So-called salt basins exist in:

1. A belt across western Alabama, central Mississippi, and East Central Louisiana.
2. The North Louisiana syncline.
3. The Northeast Texas syncline.
4. The Rio Grande syncline.
5. A belt across lower coastal Louisiana and Southeast Texas.

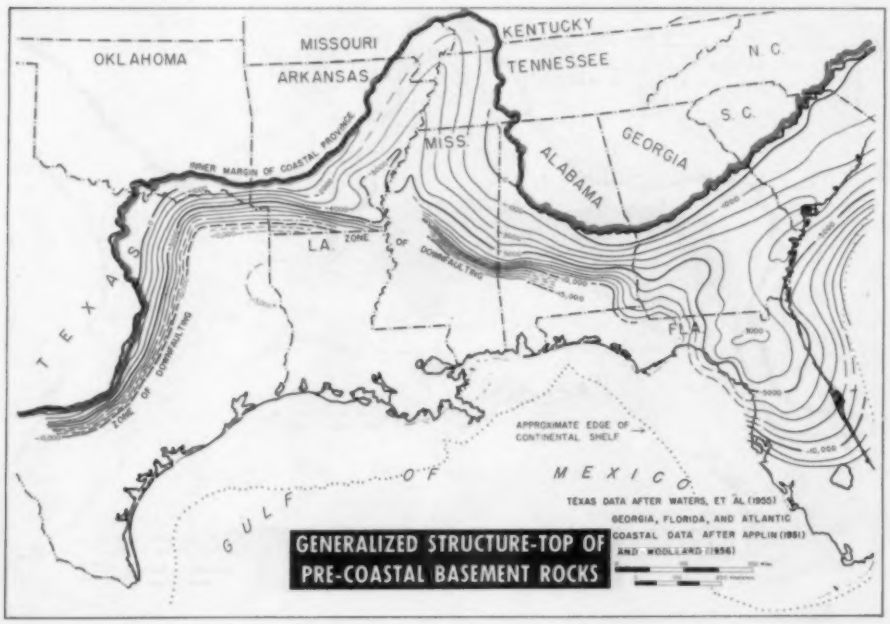
The larger anomalies trend northwest-southeast and northeast-southwest as a rule, although secondary features are present that trend north-south or east-west.



MAJOR zones of faulting, or of pronounced downflexing, exist in the inner portions of the province. These zones roughly parallel the trends of the Ouachita fold belt and are:

1. Balcones Fault System, consisting principally of down-to-the-coast normal faults with complementary faults that together form a graben system.
2. Luling System of Texas, containing mainly up-to-the-coast faults.
3. Mexia - Talco System of Texas, Arkansas System of Mississippi, Alabama, and northern Florida, consisting of a graben system.

Piercement salt domes are present in the various salt basins. Clusters of these domes appear to be associated with thick salt and thicker-than-normal sedimentary accumulations.



SCATTERED wells have encountered Paleozoic and Precambrian rocks beneath the Mesozoic and Cenozoic sediments. Data from these wells reveal that the surface of the pre-coastal rocks slopes generally gulfward, like the overlying Cenozoic and Mesozoic beds, but at a greater rate. The Ouachita fold belt can be traced from its outcrop in Oklahoma southwestward in the subsurface to the Marathon uplift. And it can also be traced southeastward across Mississippi into Alabama.

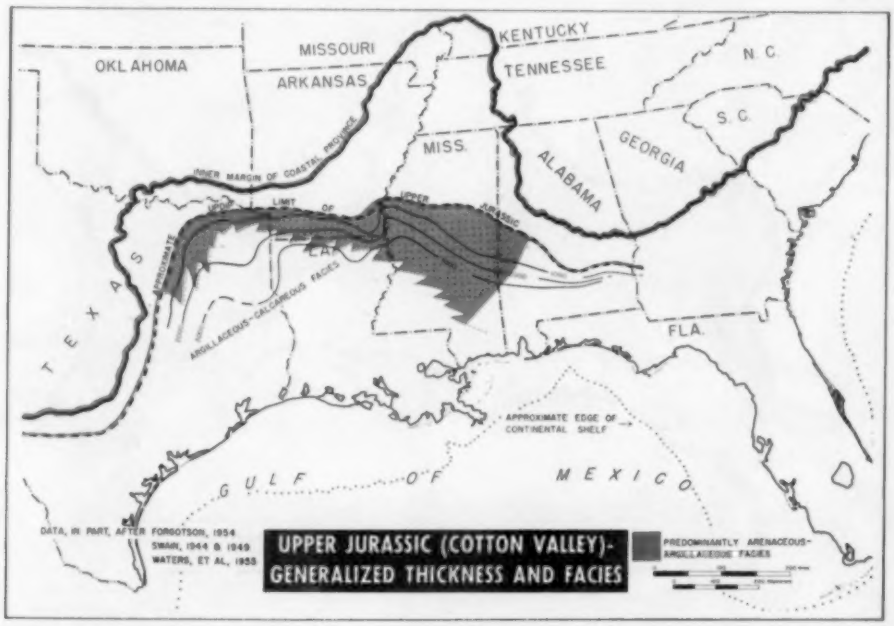
These subsurface lines of folding cannot be ignored because rocks of the same age, although of different facies, produce oil and gas in Oklahoma and Texas.

LITTLE is known about the lowermost Mesozoic formations, and the exact age of these three formations is not certain. Geologists recognize the Morehouse-Eagle Mills clastics, the Werner formation, and the Louann salt in ascending order. None of these to date has produced oil or gas. The significance of the widespread Louann salt cannot be overemphasized, because so many if not all the structural features are related to salt movement, either directly or indirectly. As a matter of fact, nearly all these features are evident as gravity anomalies, confirming the salt origin.

NORTHERN GULF COASTAL PROVINCE GENERALIZED GEOLOGIC COLUMN

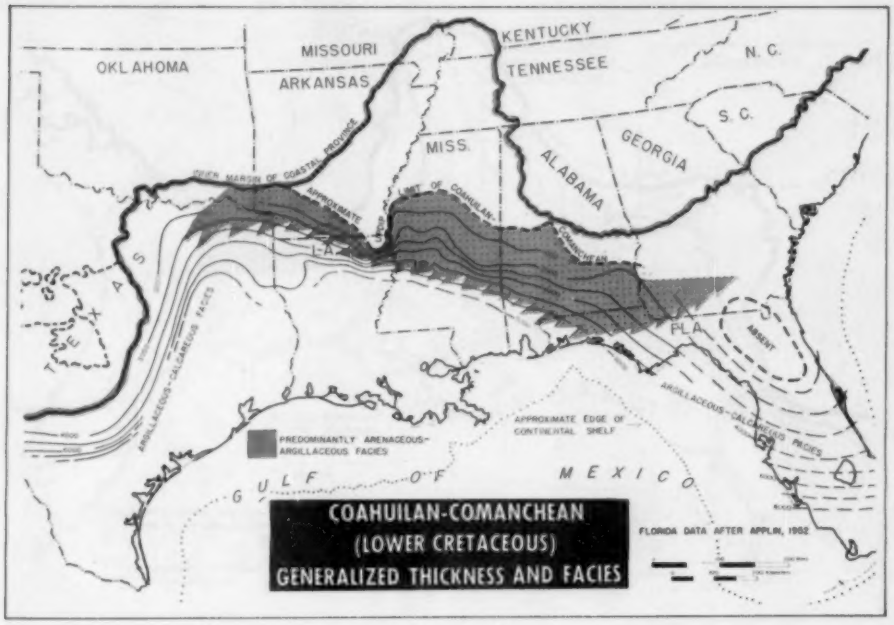
System	Series	Stage	Oil and Gas Producing Areas: Texas	Arkansas	Louisiana	Mississippi	Alabama	Florida
QUATERNARY	RECENT							
	PLEISTOCENE				●			
TERTIARY	PLIOCENE		●		●			
	MIOCENE		●		●			
	OLIGOCENE	Vicksburg	●		●			
	EOCENE	Jackson	●		●			
		Claiborne	●		●	●		
	PALEOCENE	Sabine	●		●	●		
		Midway	●	●	●	●	●	
		Wilcox Group	●	●	●	●	●	
CRETACEOUS	GULFIAN	Navarro	●	●	●	●	●	
		Taylor	●	●	●	●		
		Austin	●	●	●	●		
		Eagleford	●	●	●	●	●	
		Woodbine (Tuscaloosa)	●	●	●	●	●	
	COMANCHEAN	Washita	●	?	●	●		
		Fredericksburg	●	?	●	●		
		Trinity	●	●	●	●	●	
	COAHUILAN	Nuevo Leon & Durango Groups of Mexico (Hosston-Sligo)	●	●	●	●		●
JURASSIC (UPPER)		Cotton Valley	●	●	●			
		Haynesville	?	●	●			
		Smackover, Including Norphlet Formation — Louark Group	●	●	●	●		
JURASSIC (LOWER? AND MIDDLE) PRE-JURASSIC		Louann Salt						
		Werner Formation						
		Morehouse - Eagle Mills Formations						

Data on oil and gas producing areas principally from: (1) AIME, Statistics of Oil and Development and Production; and (2) National Oil Scouts and Landman's Assoc., Yearbooks of Oil and Gas Development in U.S.



JURASSIC rocks are known only in the subsurface in the Gulf Coastal province, but their age has been definitely established from fossil identification. Updip these beds are predominantly clastic sediments, but they grade downdip into a dominantly marine facies. Evaporite and reef facies are present in northeast Texas, in southern Arkansas, in northern Louisiana, in Mississippi, and in Alabama.

Numerous fields in northern Louisiana and southern Arkansas produce oil or gas from Jurassic rocks, principally from the Smackover limestone and sandstones in the Cotton Valley section.

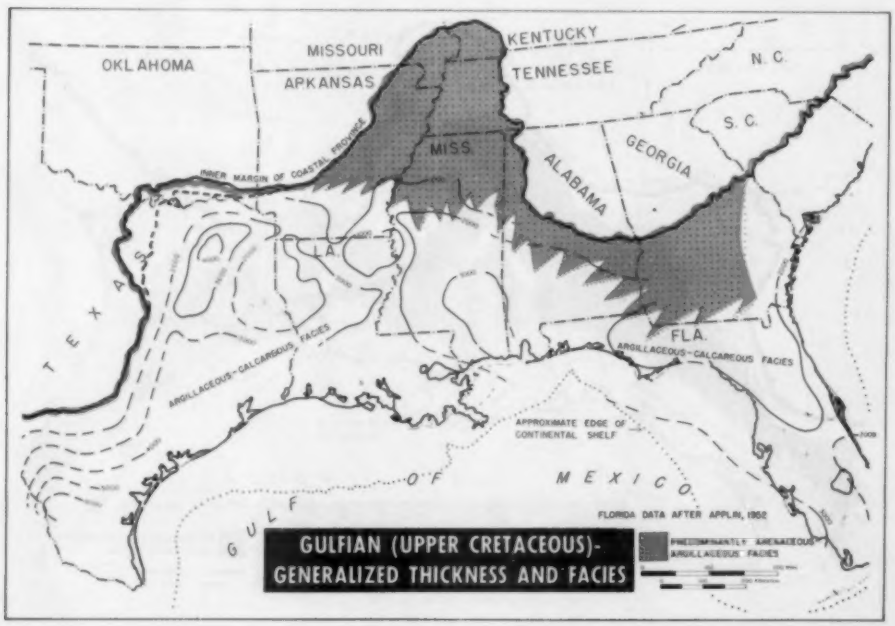


LOWER Cretaceous rocks (Coahuilan and Comanchean series) are principally red clastic facies in the updip areas of northeastern Texas, southern Arkansas, northern Louisiana, Mississippi, Alabama, and the northern panhandle of Florida. Downdip, the dominant facies is a dark argillaceous-calcareous type of deposit.

The Ferry Lake anhydrite, commonly called the Massive anhydrite, of Trinity age is present over a wide area and is used as a reliable mapping horizon. This formation can be recognized from northwestern Florida to the central part of the province in Texas.

Reef and bank limestones of Lower Cretaceous age are known in northeastern Texas, northwestern Louisiana, and southwestern Arkansas.

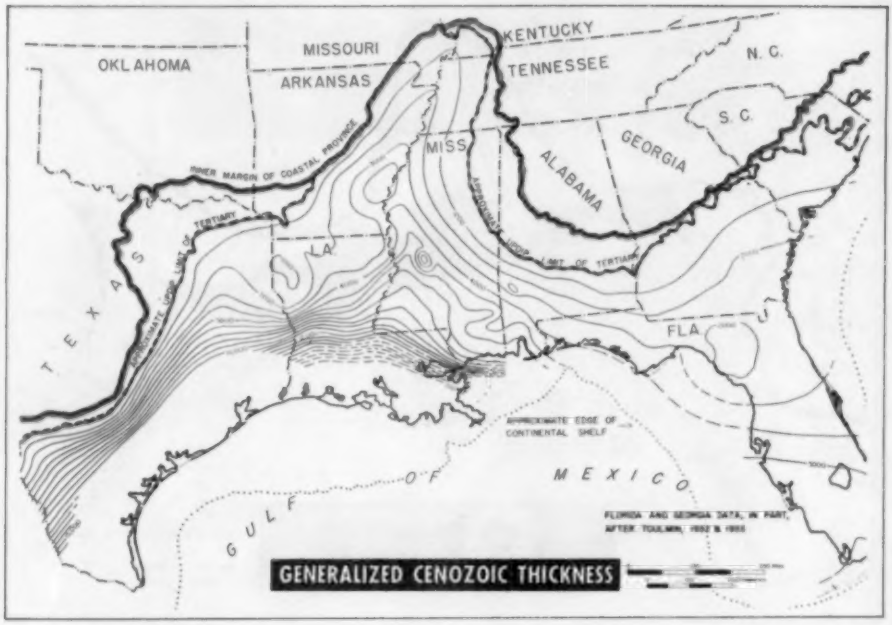
Coahuilan and Comanchean rocks account for approximately 5 per cent of the total oil discovered to date in the Gulf Coastal province.



OLDER Gulfian deposits (Tuscaloosa-Woodbine-Eagleford) are principally fine to coarse clastics except in peninsular Florida and southern Texas. Best known of these older producing zones is the fabulous Woodbine sandstone, pay zone in the prolific East Texas field.

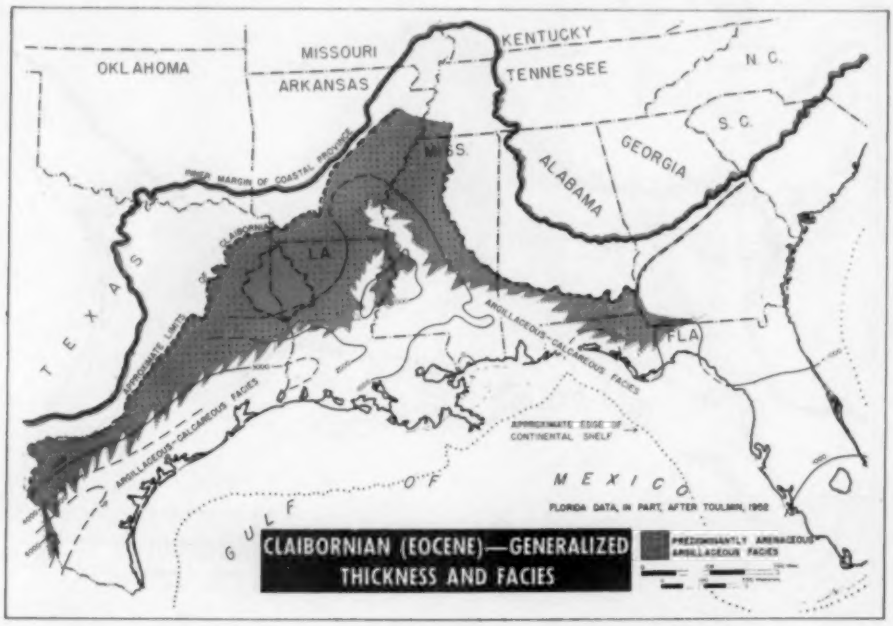
Younger Gulfian sediments (Austin, Taylor, and Navarro) vary from coarse clastic to chalk and linestone. In Alabama and Georgia, much of this sequence is clastic. Downdip and westward, marls, chalks, and limestones comprise the bulk of the sequence. Late Taylor (?) and Navarro reefs are present on the Jackson uplift of Mississippi and the Monroe uplift of western Mississippi, northeastern Louisiana, and southeastern Arkansas.

Gulfian rocks account for one third of the total oil discovered to date in the province.



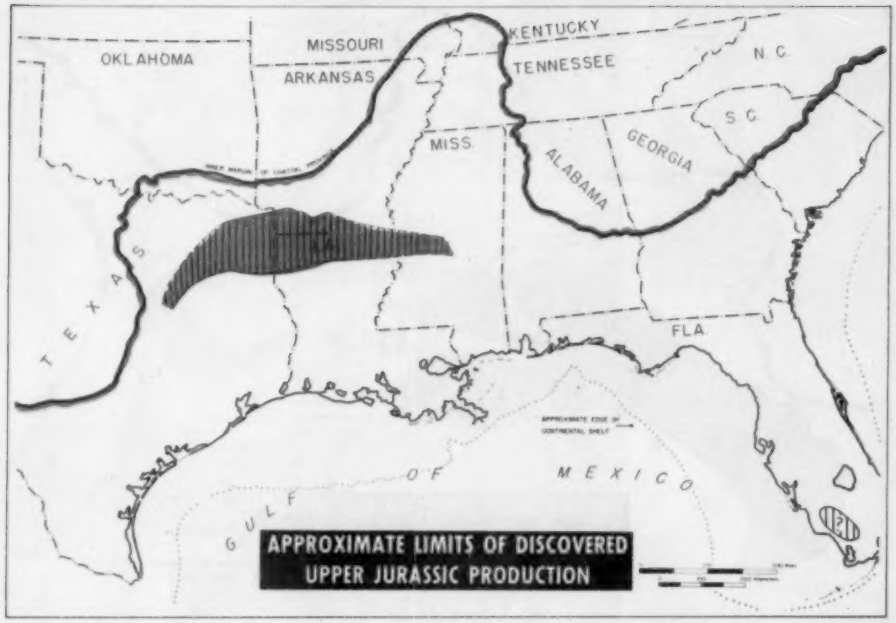
CENOZOIC rocks are dominantly deltaic in origin and these beds attain a thickness in excess of 25,000 ft. in coastal Louisiana and Texas. These sediments grade gulfward into dark marine facies, principally clays, carbonates, and fine sands, formed during nearly every epoch of deposition.

Cenozic strata are divided into Tertiary and Quaternary. The Tertiary in turn is broken down into two major divisions, the Paleogene (Older Tertiary) and the Neogene (Younger Tertiary). The major break in Tertiary deposition occurred at the close of Vicksburgian (Oligocene) time.



MIOCENE and post-Miocene sediments of the Gulf province comprise one of the great deltaic accumulations in the world. Thickness of these beds exceeds 20,000 ft. and they are principally arenaceous-argillaceous strata. Updip the rocks are principally fluviatile to deltaic marine, grading downdip (offshore) into thick marine shales and marls with interbedded marine sands. Typically, individual units thicken rapidly gulfward with equally rapid lithologic changes.

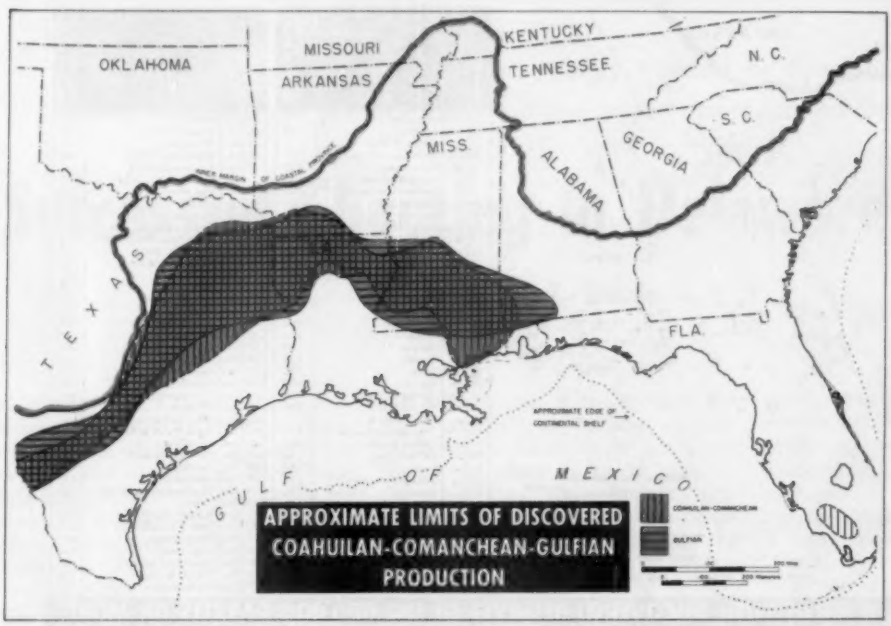
Neogene rocks, principally sands of Miocene age, contain about 25 per cent of the total oil discovered to date in the Gulf Coastal province. The province contains a total of 77 major oil fields; 52 of these major fields produce from Miocene reservoirs.



JURASSIC production is nearly all confined to northern Louisiana and southern Arkansas, although there has been minor production for these rocks in Mississippi and Texas and some production in southern Florida from rocks that may be Jurassic in age.

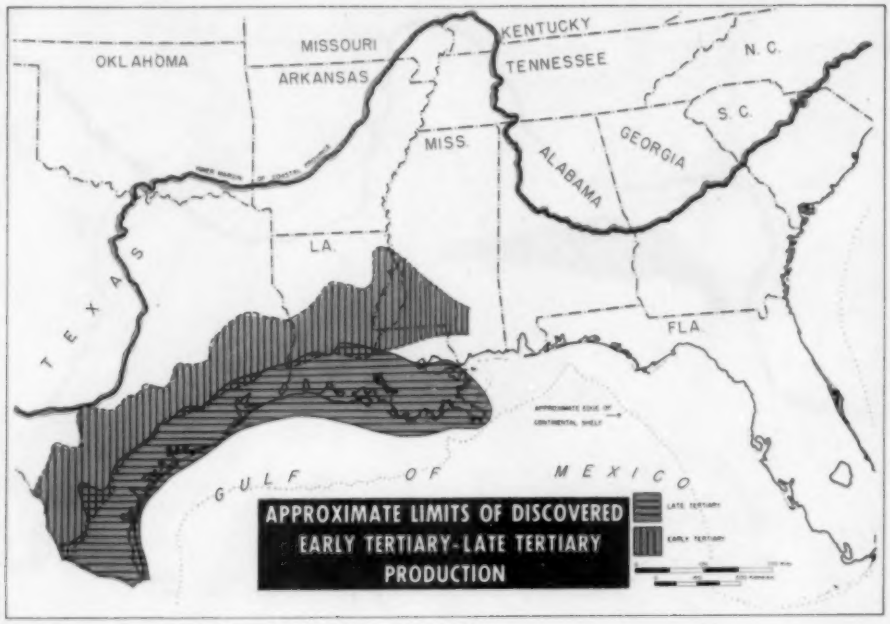
Smackover production is associated with structures, but stratigraphy is all-important. Often porous zones are developed on the flanks of the structures that are absent over the crest. Many of the Smackover structures have barren grabens on the crest of the anticline.

In northern Louisiana, several of the Cotton Valley sands have a widespread distribution and are termed "blanket sands." Along the updip limits of these sands, there are many gas-distillate fields forming a trend termed the "Cotton Valley fairway."



CRETACEOUS production (Coahuilan-Comanchean-Gulfian) occupies an arcuate belt that extends from the Rio Grande into Alabama. Many of the oil fields are multipay fault-line traps, such as Talco, Mexia, etc. Both arenaceous and carbonate rocks harbor oil. Best known of the Cretaceous fields is East Texas.

Typically the Cretaceous rocks are arenaceous updip, grading into marine limestones and shales downdip. Stratigraphy is extremely important as a controlling factor for oil accumulation, and today the accent in exploration is finding strap traps in these oil and gas-bearing strata.



TERTIARY oil ocurs in a rather narrow belt along the coastal plains of Texas and Louisiana. Inland the older rocks of Paleogene age produce; downdip or coastward the Neogene rocks, mostly sandstones of Miocene age, are the main reservoirs.

Almost all Tertiary production is related to salt movement and the high reserves, especially in the Miocene sandstones, have made the Gulf Coast one of the most active areas for oil exploration in the United States, rivaled only by West Texas with its deep reserves.

Offshore the Miocene sands are already producing on many structures with reserves of both oil and gas. There is some evidence to show that beds of Quaternary age are producing in the Louisiana offshore area, also.

OKLAHOMA
ARKANSAS
MISS.
TEXAS
GULF OF MEXICO
APPROXIMATE LIMITS OF COASTAL PLAIN
*DISCOVERED GAS CONVERTED TO OIL EQUIVALENT ON BASIS OF 15M/CF AND $3.00/BARREL
(DATA MODIFIED FROM OIL & GAS JOURNAL, JANUARY 28, 1937)

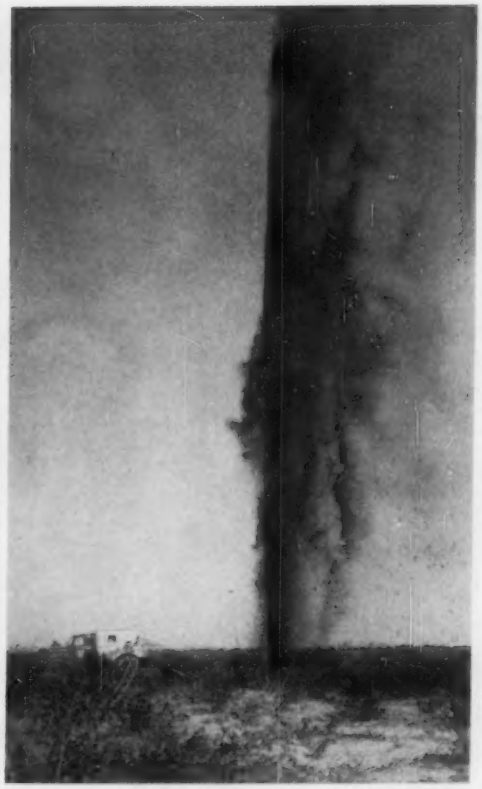
MAP NO	STATE	NAME	DISCOVERED OIL MILLIONS BBLS.*
1	Ark	Magnolia	112
2	Ark	Schuler	100
3	La	Cotton Valley	115
4	Ark-La-Tex	Rodessa (Ark.-La.-Tex.)	185
5	Tex	Darst Creek	135
6	Tex	Luling-Branyon	135
7	La	Caddo-Pine Island	400
8	La	Haynesville	155
9	La	Monroe	300
10	Miss	Basterville	100
11	Miss	Cranfield	100
12	Miss	Heidelberg	110
13	Miss	Tinsley	200
14	La	Delhi-Big Creek	225
15	La	Lake St. John	115
16	La	Homer	100
17	Ark	Smackover	500
18	Tex	East Texas	5,000
19	Tex	Hawkins	525
20	Tex	Hinchas	100
21	Tex	Powell	130
22	Tex	Tiolze	230
23	Tex	Van	400
24	Tex	Conroe & West	600
25	Tex	Katy & North	195
26	La	Bayou Sale & Horseshoe Bayou	175
27	La	Caillou Island	200
28	La	Delta Farms	110
29	La	Erath	150
30	La	Golden Meadows	110
31	La	Iowa	120
32	La	Jennings	130
33	La	Lafitte	130
34	La	Lake Washington	200
35	La	Leeville	100
36	La	Quarantine Bay	120
37	La	South Pass—Block 24	300
38	La	Venice	130
39	La	Vinton	130
40	La	Weeks Island	190
41	La	Grand Bay	120
42	La	West Cote Blanch	100
43	La	Bateman Lake—Sweet Bay Lake	130
44	La	Bay Marchand	100
45	La	Paradis	190
46	La	Duck Lake	160
47	La	Lirette—Bay Baptiste	100
48	La	Main Pass—Block 69	120
49	La	Timbalier Bay	105
50	La	Hackberry West	100
51	Tex	Anahuac	265
52	Tex	Barbers Hill	130
53	Tex	Goose Creek	135
54	Tex	Hastings	500
55	Tex	Hull & Merchant	245
56	Tex	Humble	165
57	Tex	Magnet—Withers	105
58	Tex	Old Ocean	200
59	Tex	Sour Lake	125
60	Tex	Spindletop	100
61	Tex	Thompson, Etc.	345
62	Tex	Webster	450
63	Tex	West Columbia & New	150
64	Tex	Agua Dulce & Stratton	225
65	Tex	La Gloria	150
66	Tex	Plymouth & East	160
67	Tex	Parrilla	100
68	Tex	Seeligson	400
69	Tex	Tijerina-Canales-Blucher	120
70	Tex	Greta	110
71	Tex	Refugio-North-Fox	150
72	Tex	Tom O'Conner	450
73	Tex	West Ranch	250
74	Tex	High Island	100
75	Tex	Chocolate Bayou	105
76	Tex	Pierce Junction	150
77	Tex	White Point	100

DISTRIBUTION OF FIELDS WITH DISCOVERED RESERVES OF 100,000,000 BARRELS OR MORE

MAJOR oil fields account for 67 per cent of the total reserves of the Gulf Coastal province. The majority of these major fields produce from Neogene rocks and are concentrated in a rather narrow arcuate belt along the Gulf Coast. Oil companies are convinced that a similar concentration of major oil fields should exist in offshore waters and are bending every effort to locate these prolific offshore structures.

Exploration and drilling costs combine to make offshore the most expensive area in the United States. However, the high reserves justify the effort, operators feel.

"SAUSAGE" DYNAMITE, a long column of powder with controlled velocity of detonation, has been helpful in bettering seismic records in some parts of the Delaware basin.



GETTING A RECORD out of one shot-hole is a rarity in many parts of West Texas. This single shot gets usab'e data in the notably difficult Delaware basin.

This near-virgin province has grudgingly yielded its structural secrets to the seismograph, but lately an organized approach has led to some

Successful Shooting in Delaware Basin

By M. E. Trostle

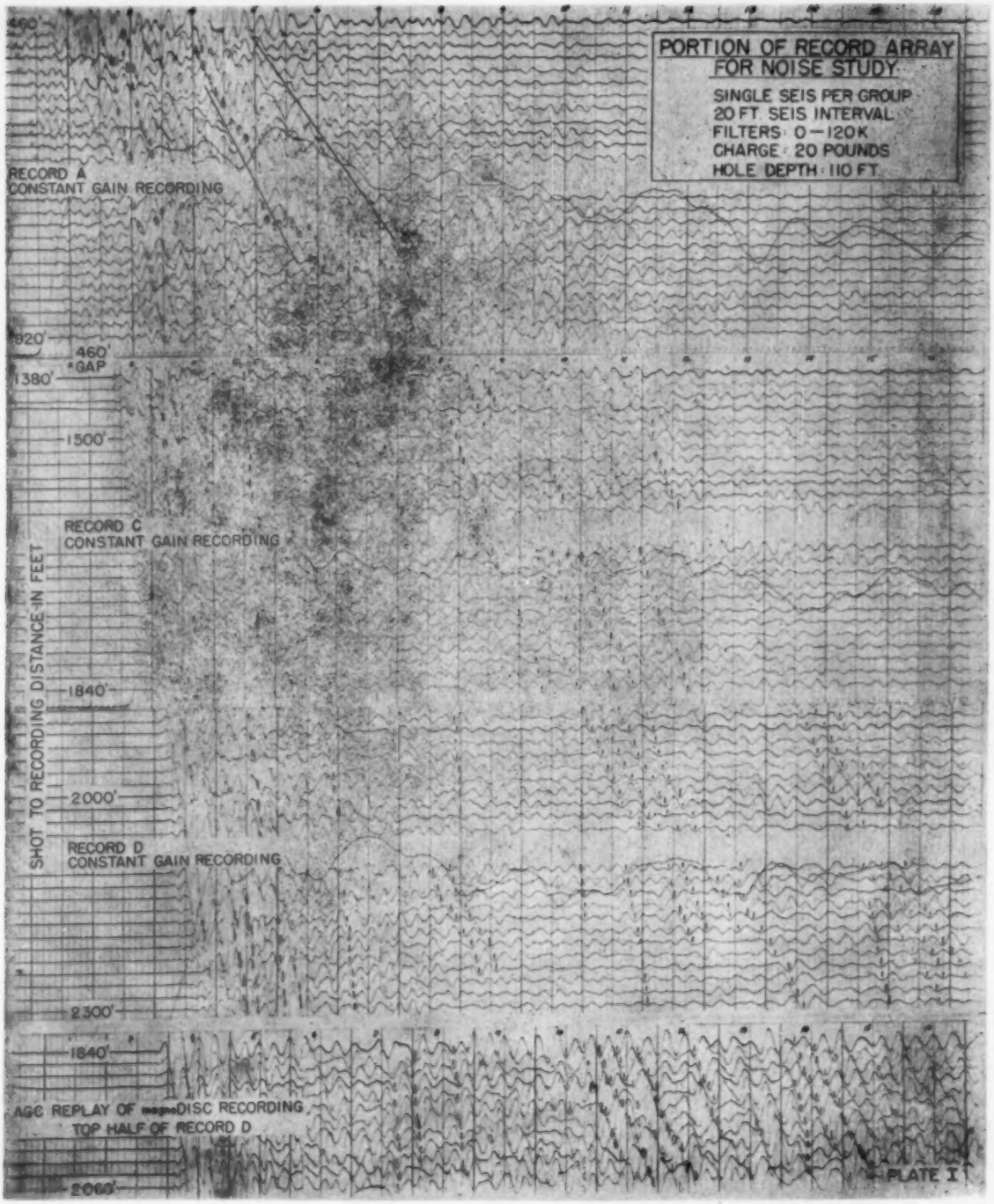
Geophysical Service, Inc.

A PRACTICALLY untouched petroleum province awaits the drill in southwestern United States. This province is the Delaware basin of West Texas and southeastern New Mexico. Many major oil companies and independents alike have conceded for a number of years that potential good production and possibly even prolific reserves may lie within the Permian section of this area.

Whatever its oil-producing potentialities, however, the Delaware basin raises its own exceptional stumbling blocks to development. Drilling costs run high because of the necessity for deep drilling and because of lost-circulation troubles in the cavernous formations which occur in parts of the area. And until recently, geophysical work has been of no great help in providing locations for the drill.

Seismograph operations . . . Since the 1930's, many major oil companies have attempted seismograph operations in their particular areas of interest in the Delaware basin. In general, their results were poor. The opinion was formed that only a small portion was workable. Over the years, "Delaware basin" became a name synonymous with poor seismic results.

Nevertheless, within the past year to 2 years there has been a renewed interest in the basin's possibilities. The new interest comes, at least in part, from the increasing demand for petroleum products which presses the need for discovering more domestic reserves, the increased economic significance of natural-gas wells, and the tight land situation in the more high-

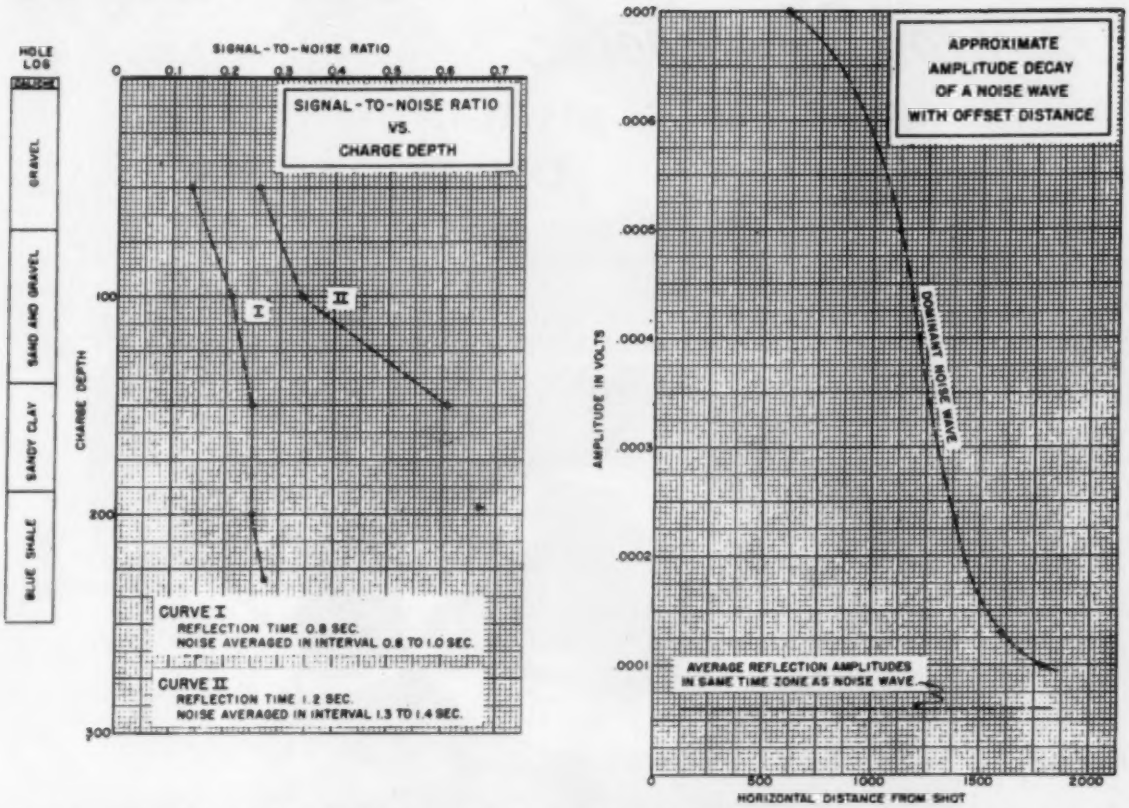


TYPICAL NOISE STUDY records in the Delaware basin. Record studies like this lead directly the design of a field technique for production shooting. Fig. 1.

ly developed areas of the United States.

Deep wildcat drilling on the periphery of the basin has increased in 1957. The most active areas have been in Pecos County, Texas, near Fort Stockton, and in southeastern New Mexico from Carlsbad to Bell Lake gas field. A big strike in any of these wildcats could bring exploration into focus for many oil operators. The shows already obtained have encouraged some companies.

One major drawback to development of the Delaware basin has been the marginal or questionable results of geophysical work. Geophysical techniques aimed at more useful results are constantly being devised and tested. It is unlikely that any one technique will solve the problems for



LEFT GRAPH (Fig. 2a) shows the relationship between signal-to-noise ratio plotted against shot depth. Right graph (Fig. 2b) reveals the amplitude decay of a noise wave with offset distance.

all areas and from the past history of seismic work in the basin, this is not surprising.

Signal-to-noise . . . In reflection seismograph exploration here, as in many other areas, the basic and primary problem is the poor signal-to-noise ratio obtained from shots. The presence of high amplitude interference set up by the shots has been conclusively illustrated in experimental measurements. Investigations into shot-generated noise were carried out by M. B. Dobrin, P. L. Lawrence, and R. Sengbush. This was described in an article in the October 1954 issue of Geophysics, "Surface and Near-Surface Waves in the Delaware Basin." Their study is highly pertinent to today's problem of unscrambling Delaware basin seismic events.

Experimental work successful . . . With knowledge of the characteristics of interference in local areas, the geophysicist should be able to design and employ the seismic tools at his disposal in the most efficient way. Just such an organized approach to Delaware basin work was made earlier this year. The accompanying illustrations are from this work, conducted for TXL Oil Corp.

Although applied here specifically to the problems of the Delaware basin, such an approach to seismic work can be beneficial in numerous areas where similar problems confront the geophysicist. Analysis of record-quality problems through noise studies has guided the development of seismic techniques in such virgin exploration areas as Australia, Libya, the Arabian Peninsula, and the United States.

The program of experimental seismic shooting was undertaken by TXL to determine early in a seismic survey whether the area lay within the range of possibilities for successful shooting. The program would employ normal field equipment and would attempt to develop specific successful techniques for record improvement, and for limiting experimental time in production work.

A series of noise studies was basic to this experimental program. Fig. 1 shows examples of typical noise study records. These records were recorded from a configuration using one shot hole and one seismometer per trace. Group interval is 20 ft. Several shots were recorded to increase coverage of the spread to more than 3,000 ft. Data shown were recorded magnetically with fixed gain amplifiers. Fixed gain recording allowed accurate measurement of amplitudes; magnetic recording allowed later AGC replay as required.

Additional records were shot with a short noise spread configuration at intervals across the line of profile.

From such records, the following data can be obtained:

1. Frequency and amplitude characteristics of noise as a function of offset distance.
2. Signal - to - noise variation with offset.
3. Apparent wave length in coherent noise waves.
4. Direction from which noise arrives at the seismometer.
5. Level of random noise and its position on the spread.

Analysis of the noise study data leads directly to the design of a technique for production shooting. Fig. 2a shows how signal-to-noise ratio versus charge depth may be plotted.

AN ECONOMICAL

trouble-shooter

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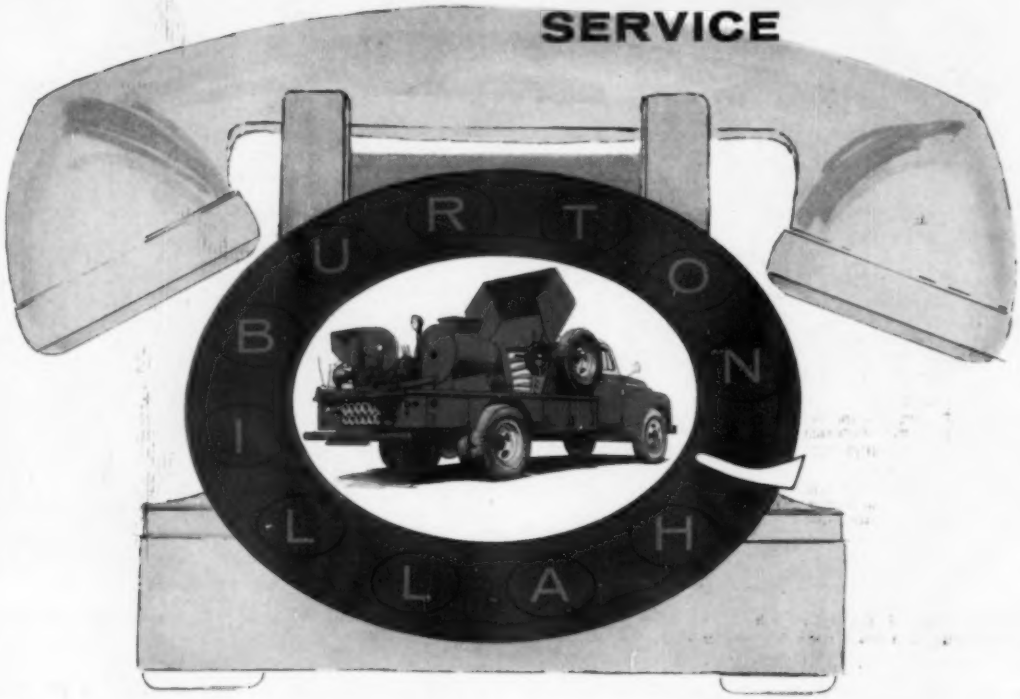

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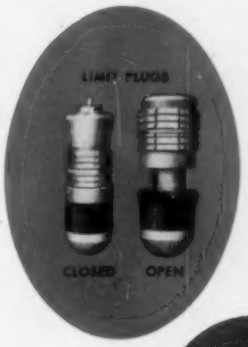

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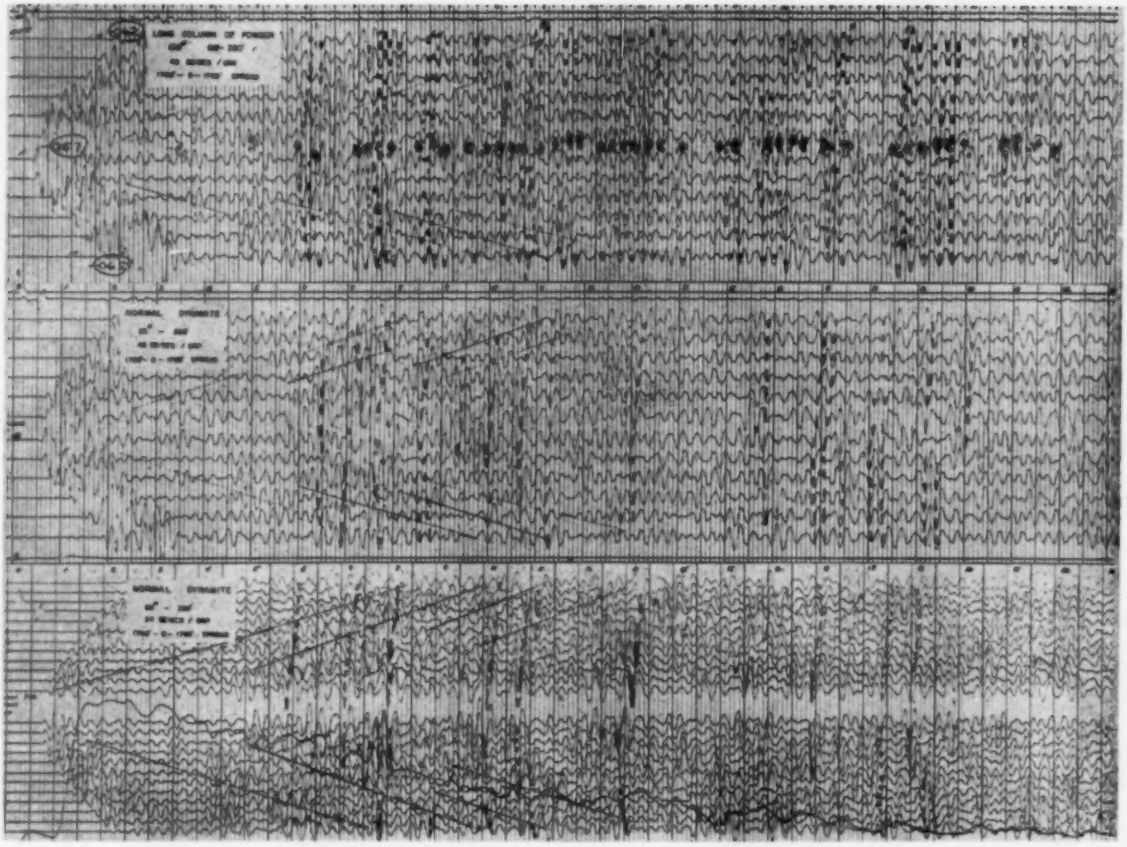


HERE YOU CAN SEE how a revised technique improved the seismic record quality. Bottom record used the normal field procedure; upper two were shot after a noise study and redesign of the field technique. Lines drawn on the records indicate the path of coherent noise and are most evident and troublesome on the bottom record. Fig. 3.

The noise records also yield information on rate of amplitude decay of a noise wave with offset distance, as shown in Fig. 2b. Value of offset spreads can thus be predicted. In an area such as that in which the records shown in Fig. 1 were shot, it would be inadvisable to use broadside offsets because the noise events, in particular the higher velocity events, would line up and give the appearance of reflection events.

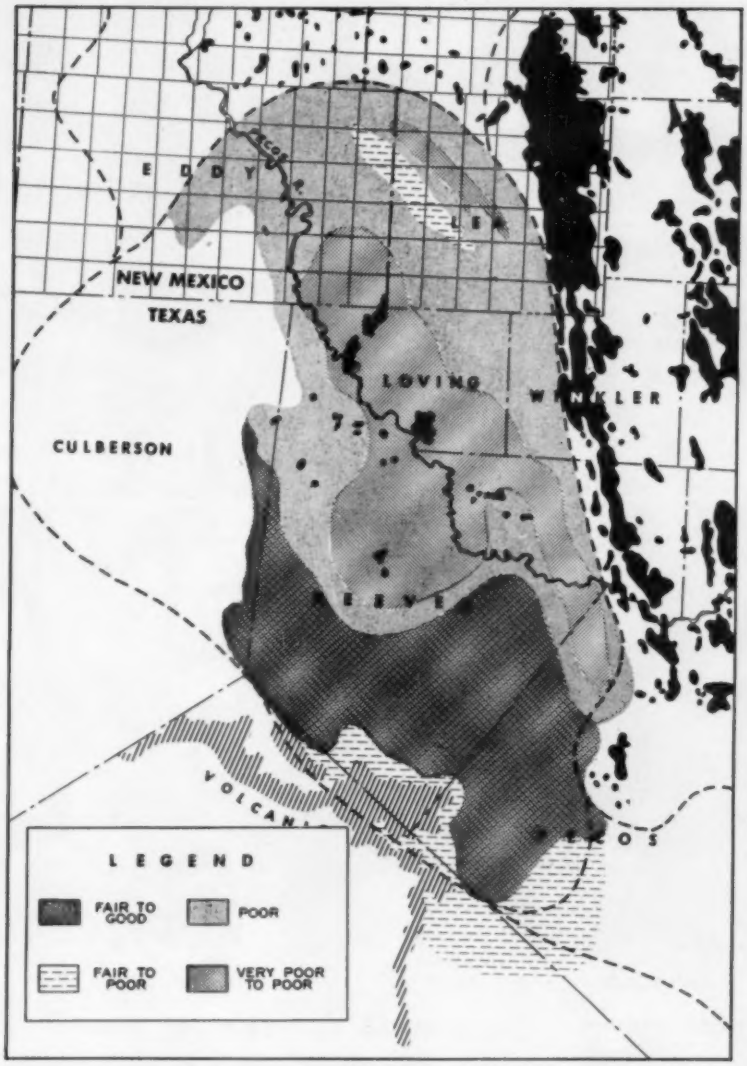
- Design of the production multiple seismometer array will be controlled by factors including wave length of noise, dip and normal moveout expected, direction noise arrives at seismometer group, amount of random noise, terrain, effect of hole depth on noise and signal, pattern hole costs, etc.
- Filter settings are determinable by study of the reflection frequencies. Difficulties may arise when many of the noise events are very close in frequency to the reflection frequencies. In selecting filter attenuation rates to be used in conjunction with magnetic recording, it is important to recognize the possibility of overloading the system with low frequencies where strong noise events of low frequency may exist.
- Mixing can be used to improve the signal-to-noise ratio under certain conditions. The controlling factors are generally the variations in weathering, the amount of normal movement and dip, and spread length, the group length, and the changes in elevation. In general, it would appear that a small amount of mixing is not objectionable for most of the Delaware basin, but weathering and dip limit the use of taper mixing. Also, in mixing of the resistance type, such as the taper mix, a strong noise event could affect a large portion of the record.

Pattern holes . . . Magnetic recording techniques are desirable in the Delaware basin because of difficulties encountered in reloading holes for repeat shots. Pattern holes drilled with air are usually filled in after one shot. Selective filtering has been applied with beneficial results in some areas.

The new sausage dynamite also has been used to advantage in some areas. Fig. 3 shows a comparison of three shots from the same location. The bottom record was recorded from geophone groups of 24 geophones per group, in line, with the shot fired in a single hole. The two records at the top of the plate were made following a noise study and redesign of the geophone spread.

From the noise analysis it was found that the interfering noises had the following characteristics:

1. At short distances the noise was complex and generally random, but had strong side components, indicating the necessity of a radial coverage of geophones.
2. Strong coherent noise interfered with the reflected energy in the 0.4 to 1.0 second portion of the record for groups beyond 900 ft. and traveled



FIELD AND EXPERIMENTAL WORK show that there are vast areas in the Delaware basin where you can expect usable seismic records. The Pecos River is undoubtedly a factor in causing poor record quality as shown. Fig. 4.

in a direct line from shot to detector.

3. In the 1.5 to 2.1 second portion of the record, random noise was predominant, and most of the coherent noise traveled a direct path from shot to detector.

4. Coherent noise attenuated rapidly with distance.

5. Noise character and reflection character were similar over a wide range of hole depths.

Under these conditions, the number of geophones per group was increased from 24 to 48 in an effort to combat random noise, and the geophone group was laid out to cover a large area to aid in eliminating offside coherent noise. Shots were taken at a hole depth indicated as optimum.

With this configuration, the center record on Fig. 3 was obtained. Improvement in the shallow portion of the record near the Delaware reflection (0.7) was shown, but additional improvement was needed in the groups near the 1,000-ft. distance where coherent noise was particularly strong.

The use of a long column of powder was considered. And from the travel paths of the coherent noise events, it was believed that improvement in noise attenuation would be found for the first 1,500 ft. of the spread by using a column of powder 170 ft. long. This charge was loaded and fired and the record at the top of Fig. 3 was obtained. In the illustration shown here the total dynamite charge varies from record to record and could be considered a contributing factor in the variation of results; however, other tests indicated that the total charge was not critical in elimination of noise.

Lines drawn on the records show the path of coherent noise wave trains as obtained from analysis of the noise study records. Note how the interference patterns terminate reflections on the bottom record.

Record quality map . . . Noise analyses made recently in the Delaware basin, together with the results of other experiments and production work, make possible the construction of a generalized record quality map of the basin for the area east of the Culberson County line. This generalized record quality map is shown in Fig. 4. The poorest record quality follows to some extent the path of the Pecos River. Thick zones of unconsolidated material typify most of the area, and noise problems are severe. Other very difficult areas include the swales, such as the San Simon swale in Lea County, New Mexico, where salts have been replaced by fill material. The southern and southwestern portions of the basin are shown to be less troublesome. The eastern half of this better zone has a high velocity near surface. The western half contains a great deal of gravel and clay.

Although the record quality map is fairly well controlled, it should be emphasized that within each of the various zones a radical change could be found for isolated areas. The map itself has been prepared to demonstrate that the possibilities of shooting the Delaware basin should not be based entirely on experience in one location alone.

Not all of the problems of the Delaware basin will be solved by obtaining recognizable and correlatable reflections, but to obtain these reflections is a primary problem.

The reflection seismograph can be used to map much of the Delaware basin with tools and techniques now available—but it will be successful only to the extent that it is guided by careful studies which indicate how the interfering noise may be penetrated.

ACKNOWLEDGMENT

This article is based upon a similar paper by the author that appears in "The Proceedings," Vol. 4, 1956-57, published by the Geophysical Society of Tulsa.

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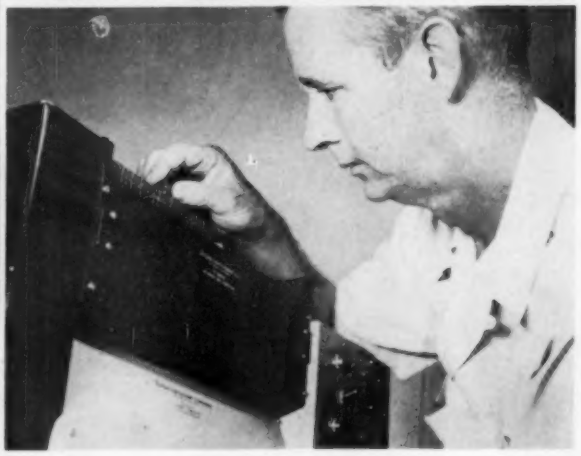

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By W. B. Agocs
Chief geophysicist, Aero Service Corp.

Airborne magnetometer surveys can . . .

1. Survey an unknown area rapidly and economically.

2. Outline a basin area; locate the axis of the basin.

3. Locate and outline zones of igneous intrusives and volcanics within the sedimentary section.

4. Make quantitative analyses to determine the depth to the igneous basement, and outline the broad structural features on the basement surface.

5. A detailed survey may be used to indicate local anomalies which may be due to a structural relief on the basement surface.

6. Aid in the interpretation of gravity surveys by the determination of basement effects as compared to sedimentary features.

7. Outline those areas which would be difficult to resolve by other geophysical survey methods.

8. Make mathematical reductions of the original magnetic data in the form of residual, derivative or vertical field determinations to resolve the individual magnetic anomalies so that their causes may be determined.

9. Determine the regional tectonic features within the basement from regional surveys, and from these analyses to deduce the local structure controlled by such tectonics.

10. Reduce considerably the cost of further geophysical exploration by limiting the total area of interest to those areas which appear to be structurally interesting, and have a sufficient thickness of sediments.

WHILE the magnetic method of geophysical prospecting is old, and has been applied successfully in petroleum exploration, the new techniques of interpretation and mathematical reduction of the magnetic data make the magnetic method of greater value in this field. This is particularly true when the techniques are coupled with the continuously recorded magnetic data obtained in airborne magnetometer surveys.

The major variations in the earth's magnetic field are caused by the variations in content and position of the magnetite in the igneous rocks. The interpreter of magnetic data must deduce the characteristics of the igneous rocks and their position or structure from the studies of the magnetic field. It is possible to give relatively accurate information about the basement where such rocks are involved.

The final product of an airborne magnetometer survey is a map whose contours show the lines of equal magnetic intensity, or the level of the magnetic field with respect to an arbitrary magnetic datum. Prior to mapping and contouring, the magnetic data have been corrected for the diurnal variations, the normal regional gradient, and leveled.

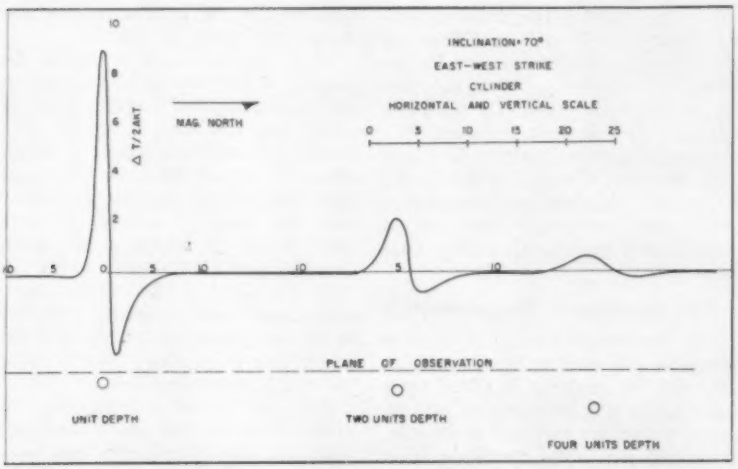
The interpreter of the magnetic data and maps attempts to determine, from the measurements of the magnetic field:

1. The thickness of the sedimentary column.

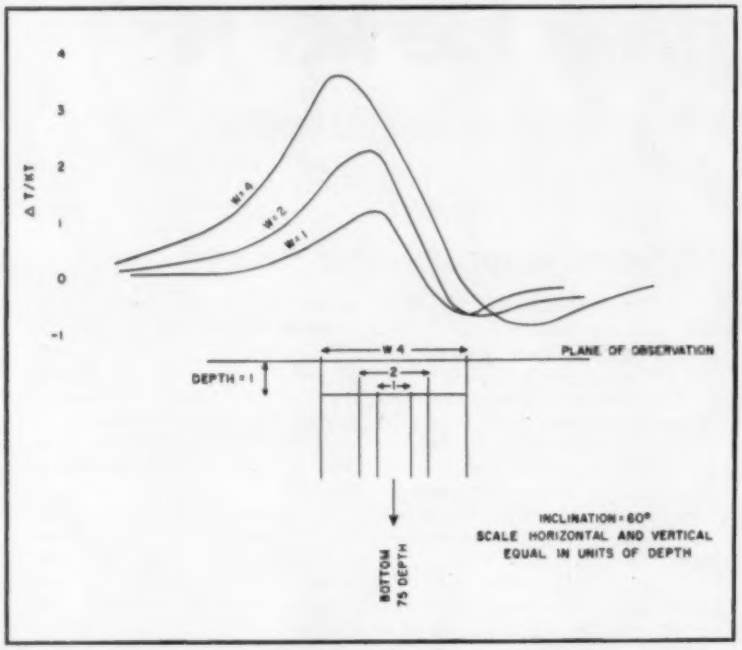
2. The possible location of the basement structures causing the variations in the magnetic field.

Magnetic exploration will not, of itself, produce the full answer, since it does not solve the problems of the sedimentary section, except in a limited manner. The sedimentary rocks are almost always poorly magnetic with the exception of the iron formations, which are strongly magnetic. However, under special conditions where the basement is deep, and utilizing high precision airborne magnetometer surveys, the interpreter can indicate those minor magnetic anomalies which may be due to sedimentary sectional discontinuities when minor, contrasting quantities of magnetite are present in sedimentary horizons.

The mapped variations of the magnetic field will show the areas where volcanics and intrusives, which complicate both the sedimentary section and the interpretation of the magnetic data, are located. The location of such areas is of extreme value to the geophysicist and the geologist. The presence of these igneous rocks will



MAGNETIC ANOMALIES vary with depth for the same cylindrical mass. Notice that both the amplitude (i.e. the relief) of the anomaly and its width change. (ΔT: the anomaly in gamma, A: the area of the cylinder. k: the susceptibility contrast with the surrounding material. T: the inducing field in gamma). Fig. 1.



HERE WE SEE how the anomaly varies as a function of the width of the prismoidal disturbance. Fig. 2.

affect the decisions as to the geophysical methods which could be applicable for structural determinations.

Causes of Magnetic Variations

Causes of the variations of the mapped magnetic field are due to the varying magnetic content of the igneous rocks, their attitude, and the strength and direction of the magnetizing field.

The greater the magnetite content of the rock the more intense the magnetic anomaly. It is possible to correlate the magnetite content to the rock type, since the more basic igneous rocks usually contain a greater amount of magnetite than the acidic igneous rocks. Furthermore in basic igneous rocks, the magnetite tends to concentrate in local zones—in the acidic igneous rocks, the magnetite is evenly distributed throughout the mass. Hence, this would cause, in the case of the basic igneous rocks, areas of local, relatively intense magnetic anomalies. But in the case of the acidic rocks, the relatively uniform distribution of the magnetite would cause a more uniform field with only minor magnetic anomalies.

The effect of increasing distance on the magnetic variation is twofold: the amplitude of the magnetic anomaly decreases, but coupled with this it is found that the width of the anomaly increases (Fig. 1).

In practice, the anomalies are only approximately related to the simple figures illustrated. However, experienced interpreters of magnetic data can separate those anomalies best suited for depth determinations.

Experience proves through the comparison with well information that about 70 per cent of the depth determinations based on magnetic data are within 20 per cent of the true depth. The remainder are over this value.

The causes of minor, local anomalies due to structural conditions on the basement surface cannot be resolved quantitatively due to the conditions imposed for depth computations to the basement; however, they may be located qualitatively. In a new area, the ratio of structural indications to minor variations of composition within the basement is low. But as experience is gained, this success ratio improves.

Use of Airborne Magnetometer

The first function of an exploration group in any area is to find oil. To this end, the geologist is called upon to examine the rocks which are exposed within the expected basin area, or in the peripheral mountain front area. However, frequently the basin area is devoid of rock exposures. Then the geologist must rely on extrapolating mountain front exposure control into the basin area. Reliance must also be placed on other tools for the evaluation of the basin area. This is particularly true in areas covered by alluvium, jungle, desert, water, etc.

The first problem to solve is the depth to the basement, or the thickness of the sediments in the basin. The second is to determine the general shape of the basin. The third is to locate any intrusives in the sedimentary section. Finally, it is necessary to locate possible oil structures. The airborne magnetometer can do the first three; and it can locate structures which are related to the basement topography. The major problem to be solved, however, is the depth to the igneous basement.

Magnetic profile from north coast of Cuba to Dog Rocks . . . Fig. 3 shows the results of a single 160-mile-long airborne magnetometer profile extending from the north coast of Cuba to Dog Rocks in the Straits of Florida.

From the start of this profile, for a distance of about 18 miles, the magnetic anomalies are sharp, relatively high amplitude. Thereafter, the magnetic anomalies are relatively gentle, broad, and of low amplitude.

The local, sharp magnetic anomalies are interpreted as being due to volcanics, and the depth to the volcanics has been found from the magnetics to range between 4,000 and 5,000 ft. Volcanics are reported at 3,017 ft. at 1A Cristales, and at 4,669 ft. at 1 Majagua, which shows an excellent depth determination from the magnetics. The magnetics do not show a northward continuation of the volcanics in the sedimentary section beyond the point shown.

North of the coast of Cuba, the southward magnetic gradient is due to the normal regional magnetic gradient which has not been removed. The broad, low-amplitude magnetic anomalies are caused by a deep igneous basement. Depth computations show that the basement ranges in depth from 20,000 ft. subsea at the north coast of Cuba, to almost 40,000 ft. subsea at Dog Rocks. These depth values are subject to gross errors due to the use of a single profile, and the simplifying assumptions used to make the depth determinations.

The depth to the basement may be extrapolated to the southward, beneath the zone of volcanics, but basement magnetic effects could not be obtained due to the relatively strong effects of the relatively shallow volcanics. At times it is possible to ob-

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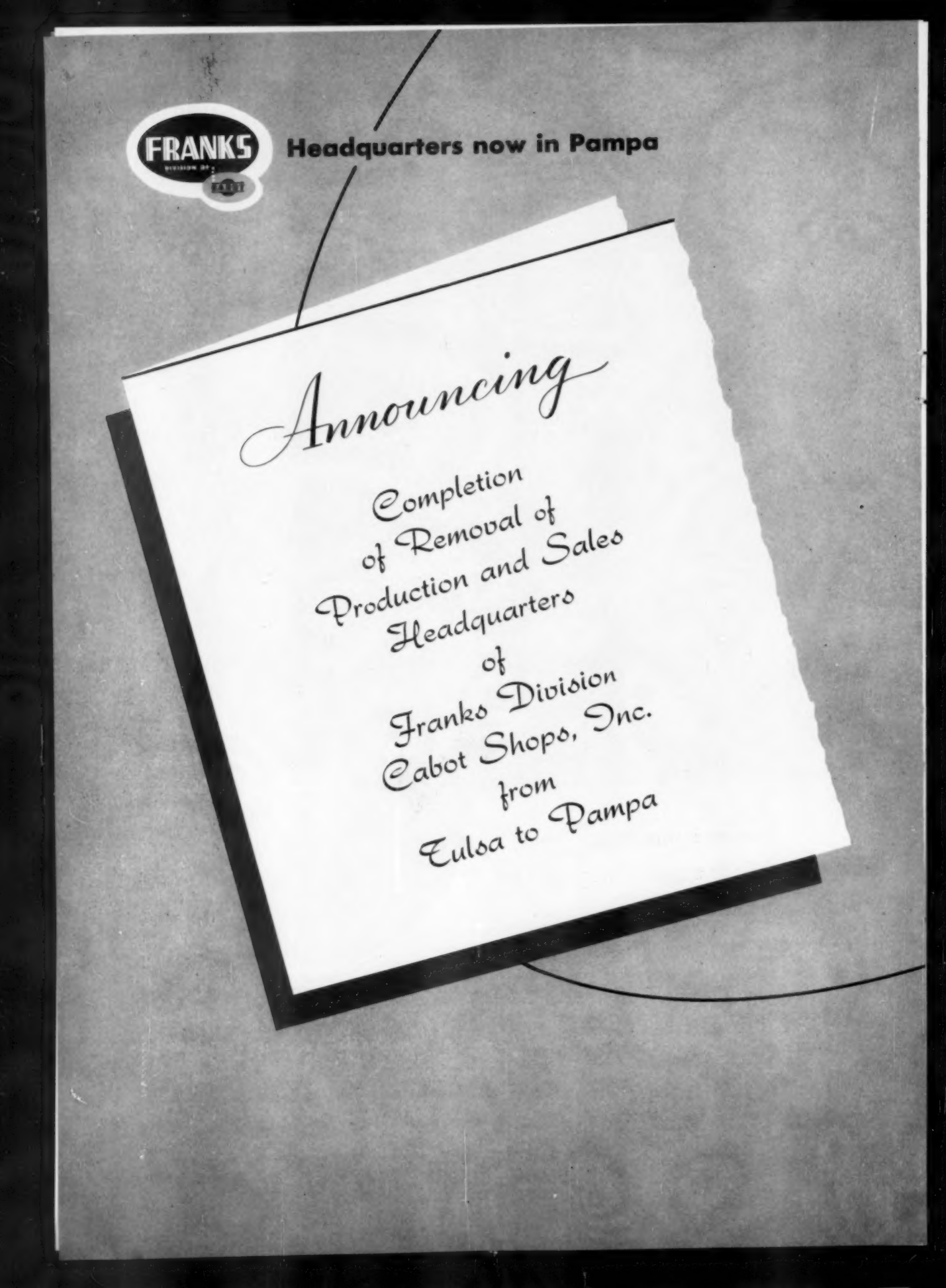
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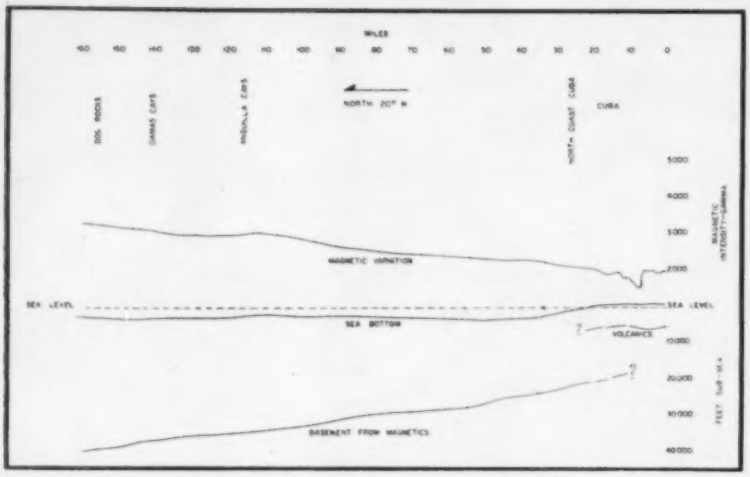

HERE IS A PROFILE based on an airborne magnetometer survey from the north coast of Cuba to Dog Rocks in the Straits of Florida. The local sharp anomalies at the extreme right are due to volcanics. Fig. 3.

serve indications of basement magnetic anomalies on which are superimposed the magnetic effects of shallow volcanics or intrusives.

Payne County, Oklahoma . . . The result of an airborne magnetometer survey (Fig. 4A) over known oil fields is compared with known subsurface data and a derivative map (Figs. 4A, 4B, and 4C). The slope of the magnetic field is to the west, and it is relatively uniform. Local magnetic highs are associated with Broyles, Ingalls, and North Ingalls fields, but the remaining oil fields do not appear to be significant magnetically. The local magnetic low in the extreme eastern part of the area may be indicative of a contact or fault line.

The mathematical reduction of the magnetic data to obtain the second vertical derivative is shown in Fig. 4C. The effect of this reduction has been to eliminate the long, uniform slopes, and to resolve the individual, minor magnetic irregularities which may be structurally significant, but which are obscured in the mapped total magnetic intensity.

The result has been to resolve further or sharpen the anomalies for the Broyles, Ingalls, and North Ingalls fields; and to resolve the magnetic anomalies for the remaining fields. Furthermore, it becomes more obvious from this reduction that the general structural dip should be to the west by the general broadening of the second derivative anomalies in progressing from the east to the west.

Geophysical Case Histories, Vols. 1 and 2 . . . The following examples are taken from Vols. 1 and 2 of Geophysical Case Histories. Unfortunately, except for specific examples, the areal extent of the geophysical control, such as the magnetic and gravity, is so limited that it is difficult to state that the particular features may be unique for the area under consideration.

Grand Saline salt dome . . . The Grand Saline salt dome is located in northeastern Van Zandt County, Texas. The subsurface structure contoured on top of the Pecan Gap is shown in Fig. 5A. The town of Grand Saline is located on the northern flank of the dome.

The vertical magnetic intensity map of the area, Fig. 5B, shows a 10 to 15 gamma negative anomaly over the upper salt mass. The author of the case history points out that the susceptibility contrast between the diamagnetic salt column and the paramagnetic sediments surrounding the salt would be insufficient to satisfy the observed magnetic anomaly, and points to the possibility that the sediments may have a higher susceptibility than that indicated by the samples which were taken.

The Bouguer gravity of the area on Fig. 5C shows a marked negative anomaly of the order of 6 milligals, and in general it agrees with the magnetic indications.

The correspondence between the magnetic and gravity maps may be taken as an example to show how the combination would aid in the interpretation of such data.

The magnetic anomaly of this salt dome is introduced to show the magnetic effect of a salt mass. It has been found in other magnetic surveys that such negative magnetic anoma-

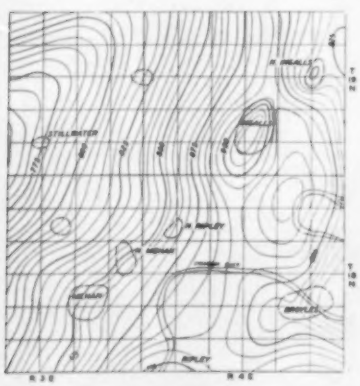

Fig. 4A

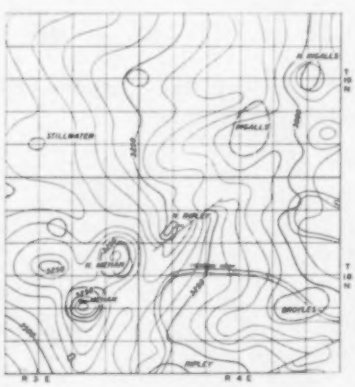

Fig. 4B

Fig. 4C

COMPARE the aeromagnetic map (Fig. 4A) with the known subsurface data (Fig. 4B) and the second derivative map (Fig. 4C). Notice how closely several of the anomalies on the second derivative map coincide with the known producing fields.

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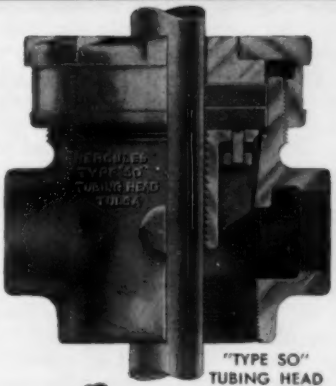

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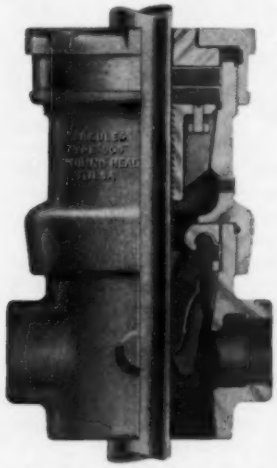
HERCULES "Type SO" and "SOS" Tubing Heads are the favorite of successful operators because of their simplicity, ruggedness and ease of operation. Available in 4½" OD to 7" OD Casing Sizes to suspend 2", 2½" or 3" tubing. Constructed from pressure cast steel and tested to 4,000 PSI. Slips are hinged for ease of installation and positive alignment.

HERCULES "Type SOS" Stripper Tubing Head is unsurpassed for use in well servicing operations as well as on flowing wells. It consists of a HERCULES "Type SO" Tubing Head with a bowl and Neoprene Tubing Stripper.



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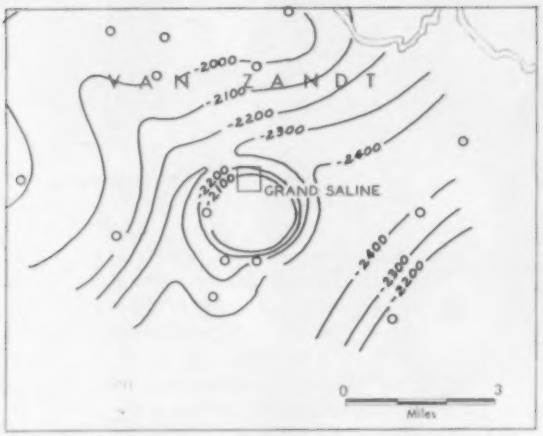

Fig. 5A

Fig. 5B

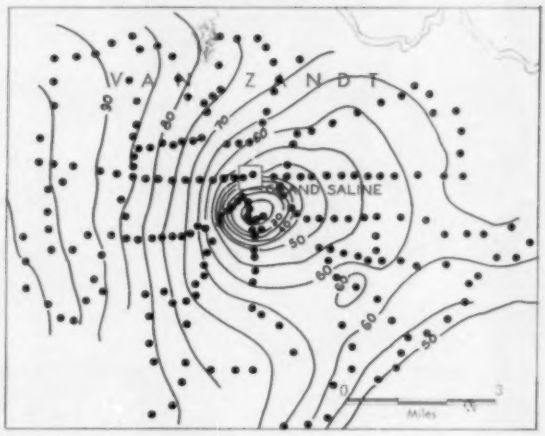

Fig. 5C

GRAND SALINE appears as a circular dome on the Pecan Gap subsurface marker (Fig. 5A). The upper salt mass is reflected by the magnetic data (Fig. 5B) and the gravity map (Fig. 5C) shows a pronounced negative anomaly.

lies are located over salt structures be they domal or anticlinal in nature.

The reader should be cautioned that not all negative magnetic anomalies will be indicative of salt-cored structures, but that magnetic surveys can be used in selected areas as a guide to the location of limited areas which should be checked further to ascertain the cause of the magnetic anomalies.

Fort Collins field . . . The magnetic control of the Fort Collins area[6] of Fig 6A, shows an elongate north-south trending magnetic high, with the regional gradient being about 150 gamma per mile in the southern half, and about 75 gamma per mile in the northern half of the survey area. This local magnetic high is formed at or near the contact between two basement rock types.

The gravity meter survey results of Fig. 6B shows a roughly north-south trending high axis; this is offset from a major high indicated to the west of the survey area, and at or near the possible contact of a density contrast within the basement. This latter feature corresponds to the indications from the magnetic survey as pointed out above.

The subsurface structure contour map of Fig. 6C shows an uplift of the order of from 800 to 1,000 ft. The correspondence between the magnetic and gravity high, and the agreement in general of the possible location of a contact or fault zone in the southern part of the area is excellent.

The author of the case history states that the anomaly is too large for the Fort Collins structure alone, and that it is composed of local structure plus a regional anomaly. On the basis of depth calculations, general character, and knowledge of the geology of the area, it is believed that the superimposed regional effect is due to density variations within the basement rocks and thus not necessarily related to the local structure.

I would interpret the excellent agreement between the magnetic and gravity surveys as being due to a basement structure or uplift, which has affected the overlying sediments, since in detail and in general these two surveys agree.

Rate of production and cost . . . In the above an attempt has been made to show briefly the meaning of magnetic surveys; what data could be abstracted by a thorough study of the magnetics; and examples of magnetic surveys over known areas. The reader is naturally interested in knowing the rate of production of such airborne surveys and their price.

The average rate of field production of airborne magnetic data depends upon a number of factors such as the flight line length, weather conditions at the time of the survey, distance of survey area from air bases, type of aircraft used, etc. The average rate of production of such data is about 100 miles per hour, with a daily production of from 400 to 600 linear miles per day. For the average petroleum survey, using a spacing between flight lines of 1 mile, the areal coverage would range from 400 to 600 sq. miles per day. In the case of reconnaissance surveys where the flight line spacing may be as great as 5 miles, the coverage would be 2,000 to 3,000 sq. miles per day.

Airborne magnetometer surveys are usually made on a fixed-fee basis, where the price per unit includes all costs for a minimum number of linear miles. This price includes:

- The purchase of the photography and base maps.
- The assembly of the flight strips and the drawing thereon of the flight

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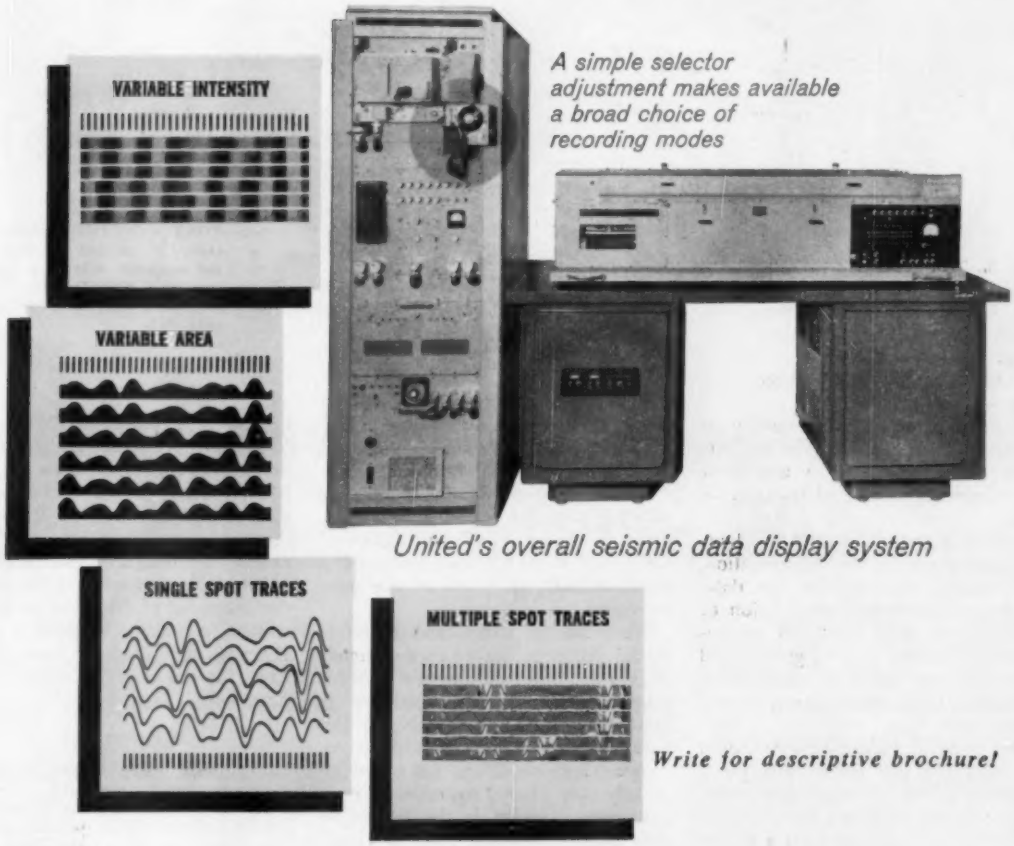

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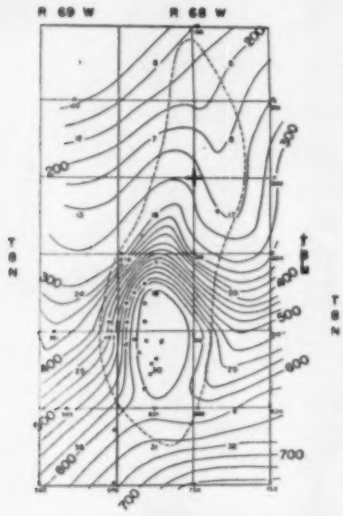

Fig. 6A

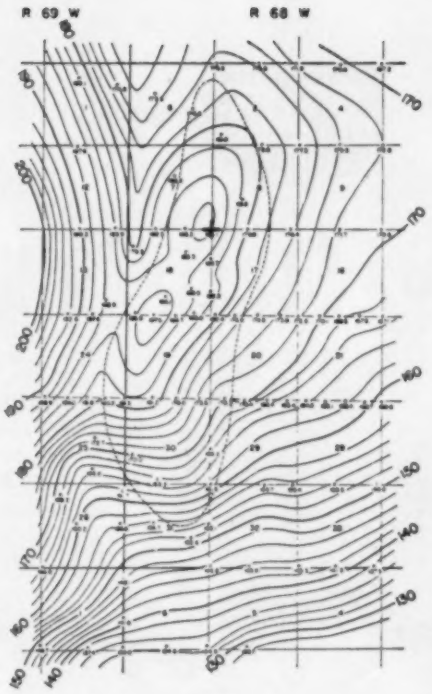

Fig. 6B

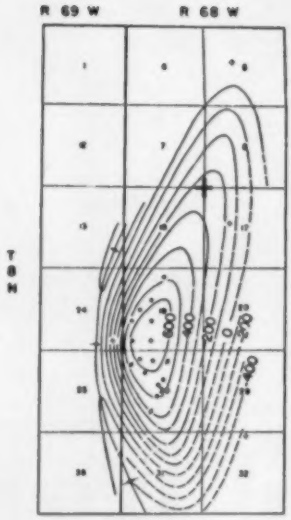

Fig. 6C

FORT COLLINS anticline, Colorado, is another example where the magnetic data (Fig. 6A) agree very well with the gravity survey (Fig. 6B) and the subsurface data (Fig. 6C).

paths at their predetermined intervals.

- The assembly of the personnel, aircraft, and equipment in the area of the survey.
- Maintenance and subsistence in the field.
- Field control of the quality of the data; the compilation of the airborne magnetometer data and their presentation as contoured isomagnetic maps.
- And if the client does not have personnel available, the interpretation, mathematical reduction of the data, the determination and preparation of a subsurface map, and the recommendation for the type of geophysical procedure best suited for the further exploration of favorable areas, if such should exist.

The price of such a service would be about $12 per linear mile for a minimum of 10,000 linear miles covering a single block in a remote area. Hence the gross cost of such a survey would be equivalent to about the cost of 2 to 3 months of seismic surveys in such remote areas necessitating the use of field camps, but with a thorough coverage of a minimum of 10,000 sq. miles, and up to as much as 50,000 sq. miles by the airborne magnetometer survey.

Airborne magnetometer surveys available for purchase . . . Airborne magnetometer maps in the petroleum basin areas are available for purchase over approximately 450,000 sq. miles in Canada and the United States from the Geological Survey of Canada, the U. S. Geological Survey, Canadian Aero Service, Ltd., Aeromagnetic Surveys, Ltd. (P.S.C.), Aero Service Corp., and Fairchild Aerial Surveys.

The Geological Survey of Canada mapped coverage is about 63,000 sq. miles in Alberta and Saskatchewan; Canadian Aero Service's coverage is about 84,000 sq. miles in the same provinces.

Aero Service Corp. and Fairchild Aerial Surveys have approximately 60,000 sq. miles of mapped airborne magnetometer coverage available in eastern Montana, western North Dakota and northwestern South Dakota.

Aero Service Corp. has available slightly over 20,000 sq. miles of magnetometer coverage in the Four Corners area; 10,000 sq. miles in southeastern Colorado; and 10,000 sq. miles in West Texas.

The U. S. Geological Survey has mapped or made available on open file all of Indiana, the Big Horn basin of Wyoming, southeastern Utah and southwestern Colorado; scattered areas in Arizona, northeastern New Mexico, scattered areas in western Oklahoma, Central Oregon, and Point Barrow, Alaska.

Acknowledgments

Permission to use the illustrations from Geophysical Case Histories, Vols. 1 and 2 was granted by Colin Campbell, business manager for the Society of Exploration Geophysicists.

The writer wishes to thank Aero Service Corp. flight crew of H. J. Moore, pilot, E. L. McLendan, copilot-navigator, and H. R. Sanders, magnetometer observer, who in the course of returning an aircraft to Miami from Central America obtained the magnetic profile used as an illustration in this article, and Harvey Poitras, of Canadian Aero Service, Ltd., for drawing the illustrative figures.

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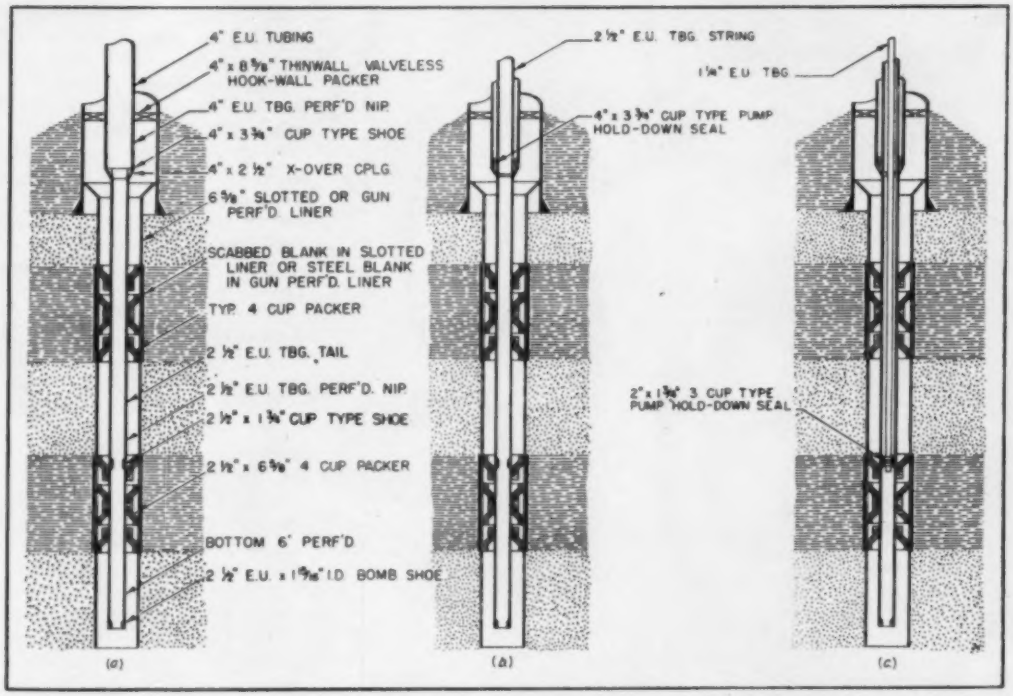

4" E.U. TUBING
4" x 8 5/8" THINWALL VALVELESS HOOK-WALL PACKER
4" E.U. TBG. PERF'D NIP.
4" x 3 3/8" CUP TYPE SHOE
4" x 2 1/2" X-OVER CPLG.
6 5/8" SLOTTED OR GUN PERF'D. LINER
SCABBED BLANK IN SLOTTED LINER OR STEEL BLANK IN GUN PERF'D. LINER
TYP. 4 CUP PACKER
2 1/2" E.U. TBG. TAIL
2 1/2" E.U. TBG. PERF'D. NIP.
2 1/2" x 1 3/4" CUP TYPE SHOE
2 1/2" x 6 5/8" 4 CUP PACKER
BOTTOM 6" PERF'D
2 1/2" E.U. x 1 5/16" I.D. BOMB SHOE
2 1/2" E.U. TBG. STRING
1 1/4" E.U. TBG.
4" x 3 3/8" CUP TYPE PUMP HOLD-DOWN SEAL
2" x 1 3/8" 3 CUP TYPE PUMP HOLD-DOWN SEAL
(a)
(b)
(c)

SUBSURFACE ASSEMBLY of concentric tubing-type injection equipment using multiple packers. Fig. 1.

Multiple Packers for selective injection Reduce Number of Injection Wells

Here is an effective way to save drilling of multiple injection wells for thick reservoir sections. Up to eight intervals have been separated for simultaneous, yet controlled, injection.

By L. V. Gefvert, R. C. Chamberlain, and C. E. Wakefield, Jr.

INJECTION operations carried out in thick reservoir sections pose the problem of control of injected fluid within the section. This problem can be reduced by bonding the injection-well liner to the shale fingers and to the sandstone shells that are usually present in the sand section and installing a packer in the blank liner opposite each break in the sand section.

Gas injection has been carried out in as many as three intervals at once by the use of multiple packers and concentric tubing strings. This method has the advantage of a continuous surface record of the volumes of fluid injected into each interval.

Water injection has been carried out simultaneously in as many as eight intervals by the use of nine packers with an injection mandrel located between packers. Rate of injection into each interval can be determined fairly accurately through the use of a spinner survey of the surface-recording type.

Both methods of selective injection of fluid by the use of multiple packers minimize fluid bypassing in thick reservoir sections without the expense of drilling additional conventionally equipped injection wells.

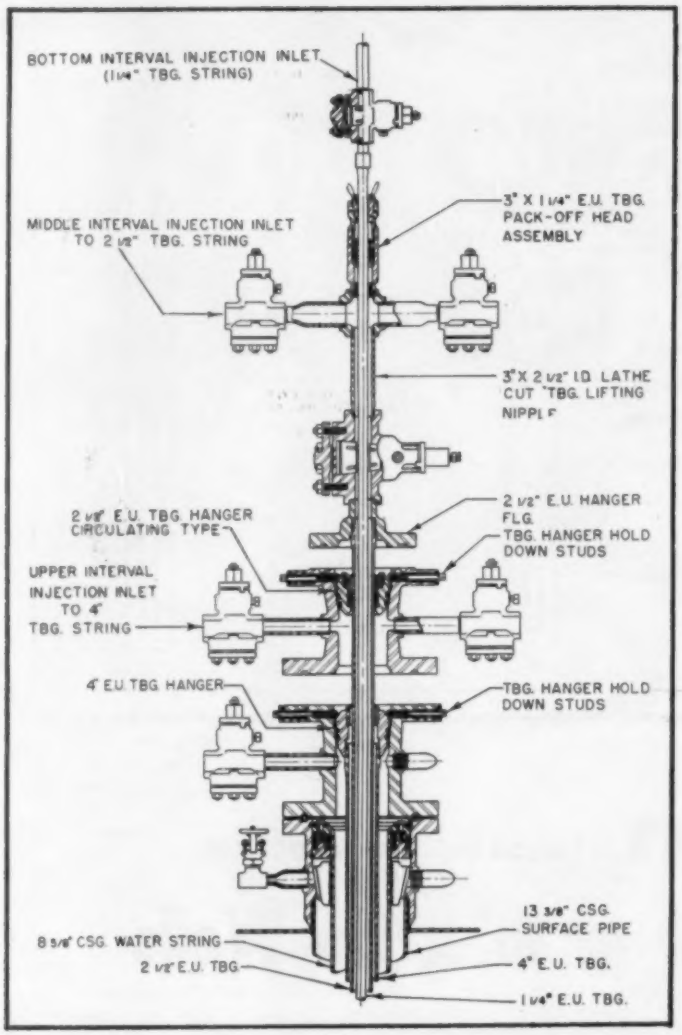
Authors are with Richfield Oil Corp., New Cuyama and Bakersfield, Calif. Paper presented at spring meeting of Pacific Coast district, A.P.I. Division of Production, Los Angeles, under title of "Multiple Packers for Selective Injection."

Multiple-Packer Use

Injection of gas, and more recently water, into reservoirs for pressure maintenance is often accompanied by bypassing. This bypassing phenomenon is especially harmful in California operations where the reservoir sands have thicknesses commonly measured in hundreds of feet. Injection of water into California reservoirs for secondary recovery demands that all possible control of the entry of water into the reservoir sands be obtained.

One approach to this control problem is the use of multiple packers in a well bore in order to obtain selective injection. This selective injection is based upon correlative shale or sandstone shell stringers which, in many reservoirs, tend to divide the reservoir sand or zone into subzones or intervals.

A well drilled for the use of mul-


BOTTOM INTERVAL INJECTION INLET (1¼" TBG. STRING)
3" X 1 1/4" E.U. TBG. PACK-OFF HEAD ASSEMBLY
MIDDLE INTERVAL INJECTION INLET TO 2 1/2" TBG. STRING
3" X 2 1/2" I.D. LATHE CUT TBG. LIFTING NIPPLE
2 1/2" E.U. HANGER FLG.
TBG. HANGER HOLD DOWN STUDS
2 1/2" E.U. TBG. HANGER CIRCULATING TYPE
UPPER INTERVAL INJECTION INLET TO 4" TBG. STRING
4" E.U. TBG. HANGER
TBG. HANGER HOLD DOWN STUDS
13 3/8" CSG. SURFACE PIPE
8 5/8" CSG. WATER STRING
4" E.U. TBG.
2 1/2" E.U. TBG.
1 1/4" E.U. TBG.

WELL-HEAD ASSEMBLY for injection through concentric tubing. Fig. 2.

tiple packers would thus usually have a solid cemented liner installed with gun perforations into the subzones. Blank sections of appropriate length would be left across the correlative shale or sandstone shell markers. The multiple packers would be installed in the blank section of the gun-perforated liner. Where oil wells were to be converted to injection operations, the slotted liners have been pulled and solidly cemented gun-perforated liners have been installed. Where the number of intervals in which injection was desired was small, cement scabs have been installed in the slotted liner opposite the correlative shale bodies.

Sometimes it has been possible to inject gas into an upper subzone where gas-cap sands exist and produce the lower subzones, gas lifting if necessary, thereby saving the cost of drilling a well. In other instances, it has been possible to carry out controlled-rate water injection into as many as eight intervals simultaneously, thereby again saving the cost of drilling additional injection wells.

Gas Injection With Concentric Tubing Strings

A safety consideration in gas-injection operations is to protect the casing from injection-gas pressures due to the hazards of possible casing leaks into the surrounding formations. These hazards would be, of course, the danger of a well blowout with cratering and the pressuring of shallow water sands above hydrostatic pressures. Thus, multiple-interval gas injection should be carried out through tubing with the use of a packer in the annulus as a packoff. Lease oil is commonly installed as the annulus fluid above the packer.

A typical gas-injection well will have 8⅝-in. casing cemented to the top of the zone with 6⅝-in. liner cemented through the reservoir sands. Three concentric strings of tubing are run in a well with the lowermost interval receiving injection gas through 1¼-in. E.U. tubing. The middle interval receives gas injected in the annular space between the 1¼-in. and 2½-in. E.U. tubing strings and the upper interval receives gas injected in the annular space between the 2½-in. and 4-in. E.U. tubing strings.

Subsurface assembly . . . The subsurface assembly of equipment is shown in Fig. 1. None of the material installed is of custom manufacture.

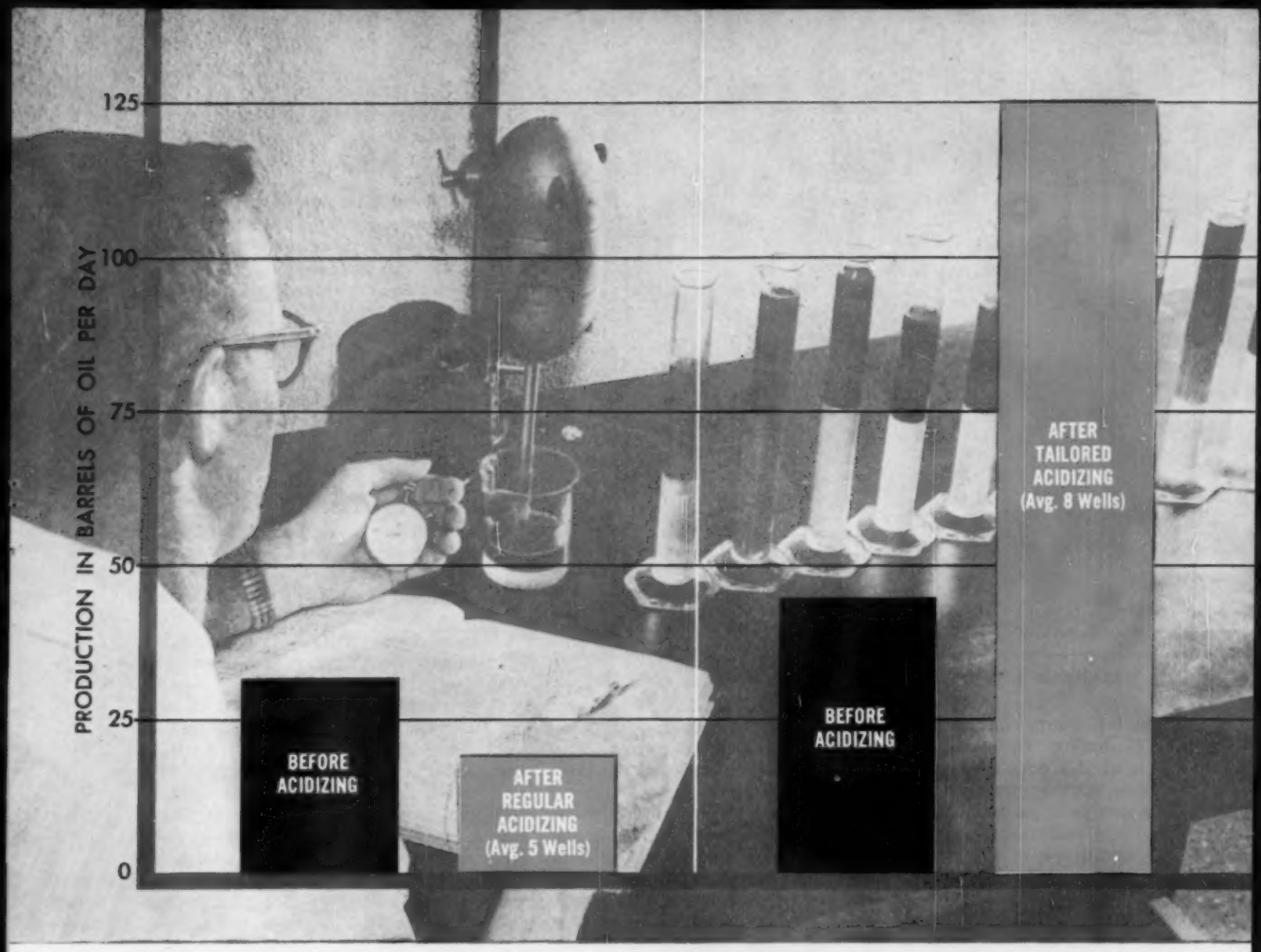
As mentioned previously, all installations of this type of equipment to date have been in 8⅝-in. casing equipped with 6⅝-in. liner. In some cases the packoff points are in scabbed portions of a slotted liner and in other cases the packoff points are in the blank portions of the selectively gun-perforated cemented liner.

The first step in the installation of this type of multiple-packer installation is to run 2½-in. E.U. tubing tail on 4-in. E.U. tubing as shown in Fig. 1(a). Two packers of the opposed-cup type are installed on the tubing string such that they will occupy desired positions in the 6⅝-in. liner. A 2½ by 1¾-in. cup-type pump shoe is installed in the tubing string immediately below the perforated tubing nipple and immediately above the lower packer to provide a sealing surface. A 4 by 3¾-in. three-cup-type pump shoe is installed just above the 4 by 2½-in. swage at the top of the 2½-in. E.U. tubing tail to provide an additional sealing surface.

The 4-in. E.U. tubing is equipped with an 8⅝ by 4-in. thin-wall valveless hook-wall packer with a perforated nipple installed just above the 4 by 3¾-in. cup-type pump shoe. This tubing string is landed in a tubing hanger at the surface as can be noted in Fig. 2.

Fig. 1(b) indicates the second step in the installation of subsurface injection equipment of the concentric-tubing type. This step is to install 2½-in. E.U. tubing of such a length that it will seat with sufficient force in the 4 by 3¾-in. three-cup-type pump shoe so that it will not leak and still land properly on the A.P.I. ring in the upper tubing head shown in Fig. 2.

Buoyancy calculations based upon well operating conditions play a role in the determination of the length of tubing string to be run. This tubing is equipped with a 4 by 3¾-in. three-cup-pump holddown seal on the lower end. The use of a pump holddown seal of this size is necessary to main-



"BLIND" ACIDIZING CAN BACKFIRE

Case In Point: McClosky Limestone

This formation tested 93 to 99 per cent soluble in acid, yet regular acid treatments often reduced, rather than increased, production. The obvious conclusion was emulsion block, but ordinary emulsion breakers were not effective.

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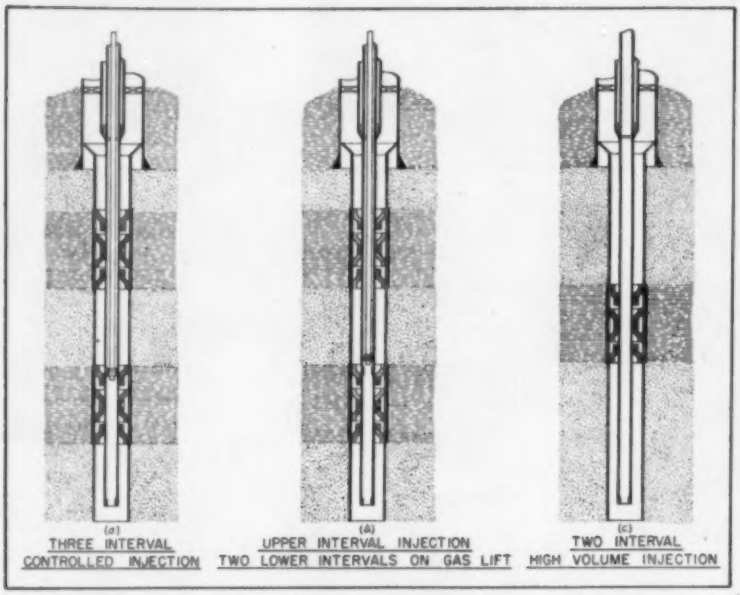


WELLHEAD ASSEMBLY for injection through concentric tubing. Fig. 2.

tain the full internal diameter of 2½-in. E.U. tubing. The tubing hanger used is of the circulating type that will allow stroking the 2½-in. tubing almost one joint length.

Fig. 1(c) indicates the third step in the installation of this equipment. This step is to install 1¼-in. E.U. tubing of such a length that the bottom will engage the seat in the 2½-in. E.U. tubing located just above the bottom packer and enough tubing will be left at the surface to engage landing slips. These are set above a 3 by 1¼-in. packing gland located immediately above the upper tubing landing assembly as can be noted in Fig. 2. The bottom of the 1¼-in. tubing string is equipped with a 2 by 1¾-in. three-cup-pump holddown seal.

Testing procedure . . . The 8⅝ by 4-in. thin-wall valveless hook-wall packer is tested by pressuring the annulus between the 8⅝-in. casing and the 4-in. tubing string. The upper cup-type packer in the 6⅝-in. liner is tested with the 2½-in. tubing landed in the 4 by 3¾-in. three-cup pump shoe by pressuring the annulus between the 4-in. tubing and the 2½-in. tubing. This procedure tests the upper two cups of this upper packer and also tests the seal at the end of the 2½-in. tubing string.

The lower cups of this upper packer are tested with the 1¼-in. tubing landed in the 2½ by 1¾-in. pump holddown shoe pressuring the annulus between the 2½-in. tubing and the 1¼-in. tubing. This test also tests the upper cups of the lower cup packer and the 2 by 1¾-in. three-cup-pump holddown seal located just above the lower packer. Pressuring the 1¼-in. tubing tests the lower cups of the lower packer.

Difficulties . . . Packer trouble has not been encountered due to the packers contacting the pipe wall only when in the 6⅝-in. liner and hence are in good condition when maneuvered into position. More difficulty has been had with the damage of pump-shoe holddown cups that are located on the 2½-in. and 1¼-in. tubing strings. Maneuvering the tubing in and out of its seat should be kept to a minimum in order to reduce holddown cup damage.

Clean-up procedure . . . Clean up of the intervals to be placed upon injection is accomplished by flowing each individually. The 2½-in. tubing string is lifted off of the pump shoe that is installed immediately above the 4 by 2½-in. swage located in the 4-in. tubing string. The 1¼-in. tubing remains suspended in its slips and packoff assembly.

The weight of the 2½-in. and the 1¼-in. tubing strings is borne by the 3 by 2½-in. i.d. lathe-cut lifting nipple shown in Fig. 2. This item does not necessarily have to be of custom manufacture but should be in order to obtain maximum mechanical strength.

Injection gas is introduced into the 4-in. tubing which removes hole fluid from the 2½-in. and 4-in. tubing strings. This operation can be conducted safely through the circulating-type tubing hanger installed in the upper tubing head as shown in Fig. 2. The 2½-in. tubing is set down on the appropriate A.P.I. ring-groove flange with the lower end of the tubing with holddown seal landing in the pump shoe located in the 4-in. tubing string.

After the upper tubing head is bolted in place securely, the 1¼-in. tubing can be emptied of hole fluid by lifting it off the cup-type shoe. This is accomplished with the 3 by 1¼-in. seal or packing gland at the surface operating under pressure. Injection gas is injected underneath this seal in the annulus space between the 2½-in. and 1¼-in. tubing.

When the 1¼-in. tubing is flowing fluid readily, it can be lowered until the holddown seal at its end engages the 2½ and 1¾-in. shoe. The middle interval can be cleaned up by flowing through the 2½-in. tubing.

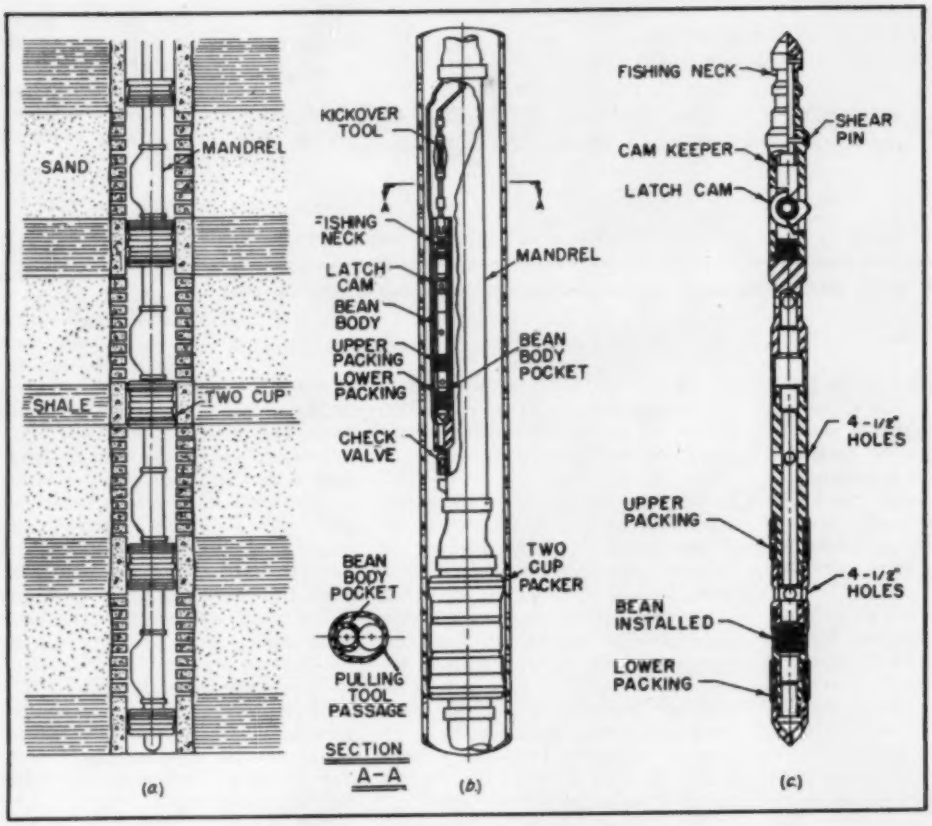
Applications . . . Fig. 3(a) illustrates how controlled three-interval injection is accomplished by having the 1¼-in. tubing engaged in the 2½ by 1¾-in. shoe. This same equipment installation could, of course, be used for two-interval gas injection with surface metering on each interval and the third for flowing production.

Fig. 3(b) illustrates how surface-metered injection gas can be introduced into the upper interval while producing the lower two intervals together. Gas-lift gas is forced through the 2½-in. tubing and lifts production through the 1¼-in. tubing.

This is accomplished by having the 1¼-in. tubing landed in the surface slips such that the holddown seal at the end of the 1¼-in. tubing does not engage the shoe. The 1¼-in. tubing need not be installed if the bottom two intervals will flow unless individual interval flow data are required.

Fig. 3(c) illustrates another variation where a single packer is installed in the liner. This system can obtain two-interval injection at high injection volumes without the friction losses that are involved in the use of 1¼-in. tubing. Another variation would be upper-interval gas injection and lower-interval flowing production. If the lower interval needs to be lifted artificially, 1¼-in. tubing could be easily installed for gas-lift purposes at a later date.

Through the employment of a hook-wall packer and one or two-cup-type packers and several tubing strings, gas injection can be accomplished without the loss of an oil drainage point in the reservoir and without having to subject the well casing to injection-gas pressure. This equipment can also be used for injecting up to three metered gas streams into the reservoir where subsurface conditions are such that the described injection program



MULTIPLE PACKERS using offset mandrels. Fig. 4.

is desirable without the cost of having to drill an additional gas-injection well.

Richfield currently has eight installations of the concentric-tubing type for gas-injection purposes and one installation for the injection of liquid propane.

Richfield Oil Corp., to date, has not employed this system of concentric tubing strings for the injection of water. Richfield water-injection operations have been either of the peripheral flood or disposal type. In both cases, the volumes of water to be injected per well have been such that friction would be a problem or else more than three-interval segregation was desired.

Multiple Packers for Water Injection

To flood thick California oil sands with water, it is desirable to control the well input profile to minimize bypassing. Fig. 4(a) illustrates a mechanical method of controlling input profile for which patents are pending approval. This method employs a cup-type packer in a cemented steel blank across whatever correlative shales or sandstone shells are present in the reservoir.

Injection profile changes are accomplished by replacing, under pressure, subsurface beans by the use of a wire line from the surface. This is accomplished by running a bean or choke mounted in an assembly or body that seats in an offset pocket in a mandrel mounted in the tubing string between isolated packers. The mandrel is illustrated in Fig. 4(b) and the bean body is illustrated in Fig. 4(c).

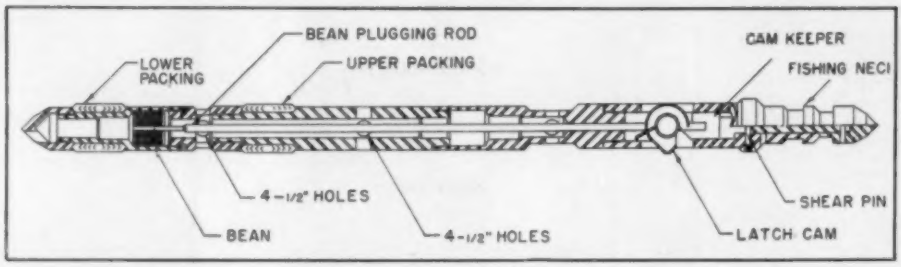
Casing and liner . . . The well casing should be larger in diameter than the perforated portion of the well bore so that the rubber cups on the packers employed will not be engaging steel surfaces during installation operations until they are near installation depth. For proper subsurface clearances, 6⅝-in., 24-lb. casing or larger must be used for a liner. A common installation for a new well is to run 7-in. casing with a 6⅝-in. liner installed as a combination string. The 6⅝-in. crossover is located above all of the intervals to be placed upon water injection.

Subsurface assembly . . . Cleanup of the individual intervals and the testing of blanks is accomplished prior to the installation of the packers.

The cup packers used are installed on a mandrel designed in such a manner that the center line of the tubing between cup-packer assemblies is not the center line of the liner. This eccentricity is sufficient to permit the use of a modification of a commonly manufactured gas-lift mandrel with sufficient clearance for injection operations in 6⅝-in., 24-lb. liner.

This mandrel has a heavily swaged or belled-out portion permitting the installation of removable tools in the swaged-out portion without disturbing the passage of wire-line tools to service any number of lower mandrels. Eccentricity has been limited to ¼ in. in order to not develop excessive bending moments in the tubing string when under peak stresses during pulling operations. It is thus necessary that the threaded joints between the mandrels and the packer assemblies be spot-welded to prevent any relative rotation while in the hole. Failure to spot-weld these joints could cause the offsets to have such an alignment that the packer and mandrel assemblies would be locked in the hole. This alignment is also important in directionally drilled wells where the swaged-out portion of the mandrels should be oriented to the upper side of the tubing string.

The cup-type packers used are con-



SUBSURFACE BLANK BEAN BODY ASSEMBLY such as this eliminates difficulties in removing blank beans. Fig. 5.

structed with a single cup up and a single cup down so that a pressure differential across the packer in either direction would cause the packer to function. The mandrel in each case is set as close to the packer beneath as possible so that any foreign material that can settle on the packer and become compacted is at a minimum thickness.

The bottom packer is used primarily to counterbalance thrust that develops in a packer installation tending to push tubing from the well which would be the case where water is used in the annular space between the tubing string and the casing and surface injection pressures are substantially above atmospheric. The bottom packer is also used to keep material from dropping below the bottom mandrel thus preserving a space for the desired downward moving of the packers upon pulling.

A ball check valve is installed on each mandrel in order to prevent inter-interval migration of injection water whenever a well is down. This check valve would also lessen the possibility of sand depositing on top of the packers.

Installation procedure . . . No difficulties have been encountered in the installation of 14 packer and mandrel assemblies and 11 wells to date. The ball-check valve on each mandrel is fouled with a piece of very thin soft wire to permit interflow of well fluid between the tubing and the annular space. Another more preferable method is to install an open bean with a rod attached of such a length that the ball check is held off of the check-valve seat.

After the packers are in place, the bean body with the rod attached is pulled from the bean-body pocket of each individual packer permitting the ball check to seat. In either method a large-diameter bean or choke would be installed in each bean body for installation purposes. In addition to this precaution, the tubing has a standing valve installed below the bottom packer so that the hole fluid below the bottom packer can be easily displaced by the assembly of packers being lowered into place.

Drilling procedure . . . Pulling this assembly from the well has been accomplished successfully to date on four different occasions without difficulty. Success of pulling is attributed to the fact that the amount of foreign material that can accumulate and compact on the cup immediately below each mandrel is kept to a minimum as described earlier. The space below the bottom packer being available for downward motion of the packer assembly is an additional factor contributing to pulling success.

Mandrel and bean body . . . Fig. 4(b) is a typical mandrel used in water-injection operations. This drawing shows the bean body in place in its recess and the location of the check valve mentioned earlier. Wire-line tools used to replace a commonly manufactured type of gas-lift valve is used to install and remove this bean body. The wire-line equipment can selectively change under pressure any one of the installed bean bodies. There is no limitation to the number of installations in a particular well bore that can be serviced by this wire-line tool.

Fig. 4(c) is a bean body with the subsurface bean and its single rubber O-ring in place. This drawing indicates the use of a latch that engages a component part in the bean-body pocket to mechanically hold the bean body in place. The light shear pin shown is sheared by jarring with the wire-line tools. The shear pin releases the cam keeper allowing it to be pulled in such a manner that it will rotate free from engaging the component part of the bean-body pocket thereby releasing the bean body.

The lower set of cup packing and the O-ring on the bean are the only actively employed sealing mechanisms used to prevent the injected water from bypassing the bean. The other cup packing shown is redundant, being a carryover from a previous design and currently functions only as a centering guide.

Blank bean body . . . In the operation of the 11 input wells to date, there have been situations where it has been undesirable to inject water into a particular interval at either the outset of well operation or during the course of well operation. The installation of blank beans has been accomplished with the same ease as the installation of bored beans.

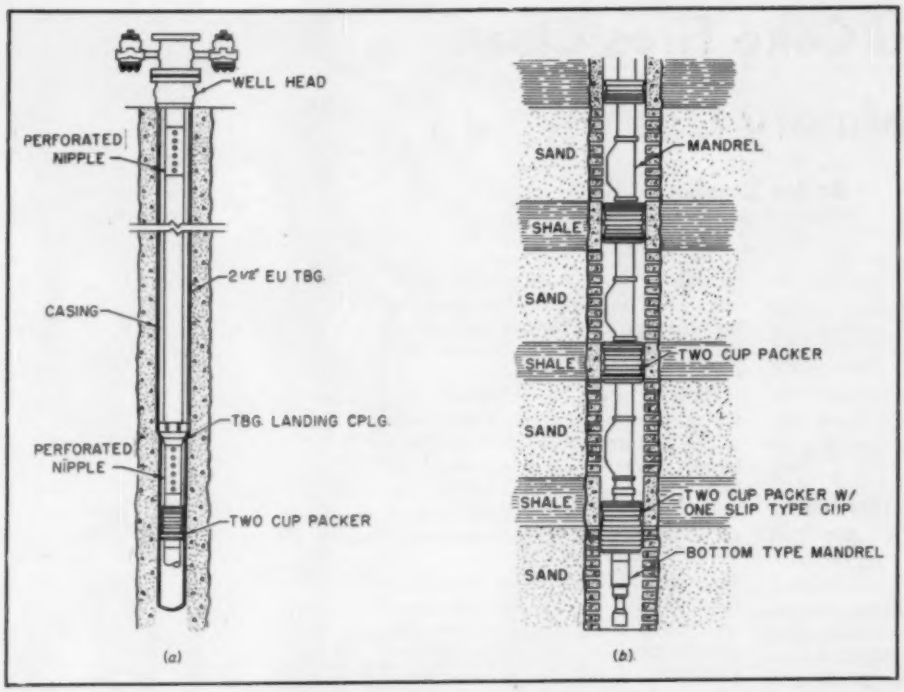
The removal of blank beans has met with difficulty in those cases where a sizable pressure differential has developed across the bean itself. Such a pressure differential is due to the blanked injection interval being under static reservoir conditions while the internal pressure in the mandrel is that of the interval in which it is most difficult to inject the desired amount of water. This force so generated can be so great that a wire-line cannot pull the bean body from the bean body seat.

One method of alleviating this difficulty is to install a very small-diameter bean which would not allow a significant amount of water to be injected into the interval that is to be idle. This method obviously has several hazards.

Another method that is more satisfactory is shown in Fig. 5. By the shearing of a small pin, the latch keeper is disengaged from the latch cam which is spring loaded so that it will rotate, releasing the bean body for pulling. Simultaneously, the stainless-steel bean plugging rod will be pulled from the hole in the bean permitting pressure equalization across the bean body. A conventional bean body is then installed for normal injection operations.

Injection rates . . . The most successful determination of interval input rate to date has been by the use of surface-recording spinner instrument that is positioned in the 2½-in. tubing immediately above each injection mandrel. The per cent loss of r.p.m. in each progressively deeper interval is noted and the input rate to each interval is thereby computed. This equipment has been run successfully with surface pressures as high as 2,700 psi.

A metering method tested unsuccessfully was the introduction of a



MODIFCATIONS OF PACKER ASSEMBLIES can be made to reduce required pump pressures (a) and to prevent unbalanced thrust (b). Fig. 6.

slug of electrolyte into the well at the surface and measuring the amount of time it takes for the electrolyte to travel from one injection point to the next deeper injection point by the use of properly spaced electrodes hung in the tubing string. This method failed due to the electrolyte tending to mix with the turbulent injected water.

A promising method that has not been tested is the use of a propeller type of meter that can be installed in a modified bean body in a recess in series with the bean so that all the water injected through the bean would flow through the meter and yet the entire assembly would be removable by wire line. By appropriate use of brass collector rings and a make-and-break contactor the r.p.m. of the meter would be transmitted by a multiconductor cable to the surface where a recorder could count and record periodically the r.p.m. of the meter for each interval. This multiconductor cable would be permanently clamped to the exterior of the tubing string. Cup packer modifications would have to be made to accommodate this cable in the annular space. The recorder could be of the type that could accumulate the data of one or more wells and also transmit the data to a remote control point.

The competency of the bond of the cement with the formation and of the packer rubbers with the wall of the pipe can be checked by the use of a radioactive-isotope survey. This iodine isotope injected into the water stream a few feet below the bond point in question can trace the flow of water behind the tubing to establish whether interval leakage in or near the well bore exists.

Equipment modifications . . . One modification of this equipment is made in those cases where it is desired to inject high volumes of water and friction in the 2½-in. E.U. tubing string causes excessive pump pressures. This modification is to install a perforated nipple in the tubing string at the surface and again at depth so that the casing annulus can be used as a conductor of injection water.

The use of this modification necessitates the addition of a cup looking up on the first packer that is set in the liner in the steel blank above the first set of perforations. This packer isolates the upper injection interval from wellhead injection pressure which is exerted on the casing above. This packer and the position of the perforated nipples in the tubing string is depicted in Fig. 6(a). The use of this additional cup causes a thrust to develop tending to push the total packer and mandrel assembly down the hole. A tubing landing coupling designed to land upon the casing crossover or liner hanger absorbs the thrust developed.

When it is necessary to pull this assembly of packers and mandrels from the well, and if a nondestructive pull will not remove the entire packer and mandrel assembly from the well, the tubing should be cut below the tubing landing coupling. With the use of an appropriate socket latched on to the remaining tubing in the hole the movement of the tubing down and up the hole would facilitate the removal of the packer and mandrel assembly.

In those well completions where there is a perforated interval present on bottom in place of the desired 20 or 30 ft. of blank liner, and it is desired to inject water into this bottom interval, a situation of unbalanced thrust would again develop. This thrust is absorbed by the use of a hydraulically actuated slip-type cup gripping the liner. This type of installation is depicted in Fig. 6(b).

Richfield has not had the situation presented where it is desirable to inject gas into more than three intervals simultaneously; however, the method described above for water injection through one tubing string could be applied for the injection of gas.

We Give Credit

We inadvertently omitted credit for the sources of some of the material in our special drilling section, "How to Get Your Money's Worth From Your Mud Pumps," October 14, page 123.

Mission Manufacturing Co. furnished many of the photographs, and many of the ideas in the text came from the company's manual on mud-pump maintenance.

National Supply Co. supplied photographs, drawings, and several ideas.

Gardner-Denver Co. furnished several photographs.

Wilson Manufacturing Co., Inc., also supplied illustrations.

Representatives of these firms, and of **Oil Well Supply,** division of United States Steel Corp., made many helpful suggestions about the text material.

Pulverized Coke Fires Clean In First Refinery Use

By Joe Brendler
Cities Service Oil Co.

CITIES SERVICE OIL CO. is burning petroleum coke under steam boilers at its East Chicago refinery. Equipment has been added to existing boilers to handle, pulverize, and burn approximately 160 tons per day of delayed petroleum coke. The stacks on the coke-burning boilers are as clear as those on gas-fired boilers.

At the East Chicago plant, coke is moved to the boiler house in railroad hopper cars. Here the coke is crushed to minus ¾-in. size and stored in overhead coke bunkers. From the bunkers the coke flows into the mills where it is pulverized. The pulverized fuel is carried to the burners through pipe ducts by a stream of hot air.

Most large steam boilers installed during the last 25 years have been equipped to burn pulverized coal. For this reason much has been published concerning pulverized coal burning. Efforts to burn pulverized petroleum coke have been generally sporadic. Therefore, little information is available on this subject.

The basic concept of pulverized fuel burning is simple. Fuel is reduced to powder form. The powder is mixed with a stream of air and the mixture is handled like a gas.

Difficulties . . . The main problem met in the design of petroleum-coke-burning installations is maintenance of ignition. Petroleum coke contains considerably less volatile matter than most coal. It is, therefore, more difficult to maintain ignition and obtain good combustion with petroleum-coke fuel. This would present no great difficulty if the coke were fired in conventional refinery heaters with ample areas of incandescent refractory to assist combustion.

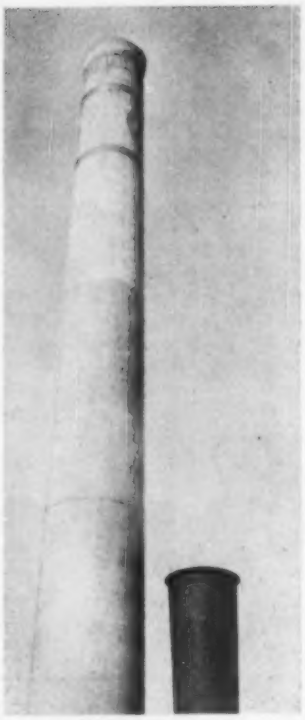
In this case the boilers converted to coke firing were of modern design with completely water-cooled walls (tangent tube construction). The interiors of the boiler fireboxes were almost complete black body surfaces. This made the problem more difficult.

Fine pulverizing and a high firebox temperature appeared to be basic requirements for the successful operation of this installation. Therefore, the major design efforts were concentrated on the pulverizers, burners, and firebox modifications.

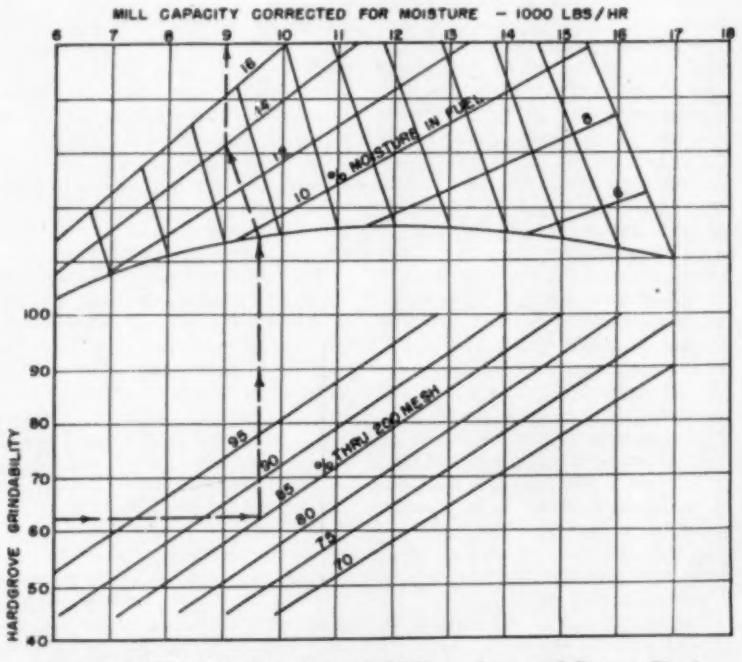
Pulverizers used to grind solid fuel are referred to as mills. A discussion of mill performance involves two basic terms, fineness and grindability. In order to evaluate mill performance, the units by which each of these terms is expressed must be fully understood.

Fineness . . . The fineness of solids is usually expressed as the percentage which will pass through a sieve with specified openings. Samples and test procedure should be in accordance with A.S.T.M. Standard D-197-30. The 50, 200, and 325-mesh screens are commonly used in pulverized-fuel size determinations. The 50-mesh determines the per cent oversize, the 200-mesh the percentage of fines, and the 325-mesh the percentage of superfines.

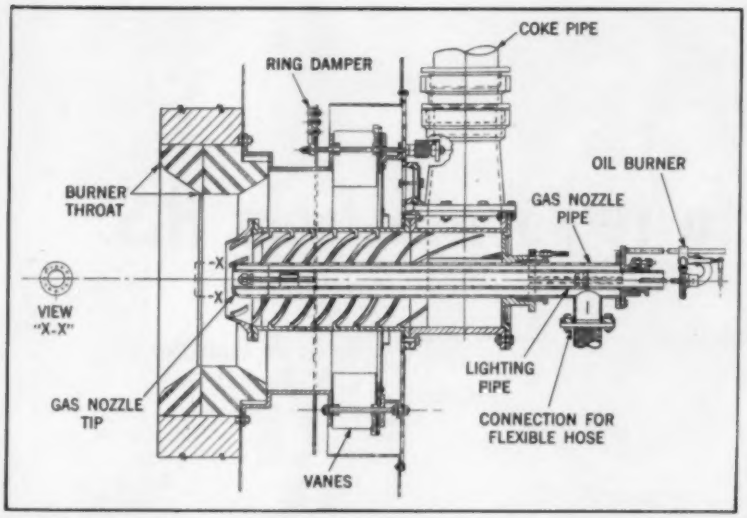
Grindability . . . The grinding characteristics of solid fuel are usually expressed as Hardgrove numbers determined in accordance with A.S.T.M. Standard D-409-51. This method determines the relative grindability or



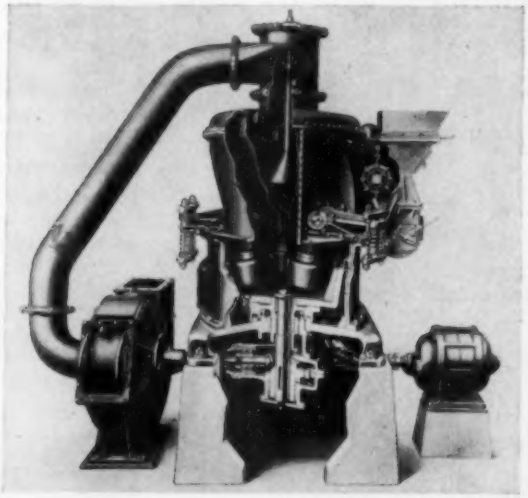
SHORT STEEL STACK is on one of the boilers burning pulverized coal. Tall stack serves boilers firing fuel gas. Both stacks are clear.



MILL CAPACITY depends on coke grindability, moisture, and fineness. Fig. 1.



BOILER BURNERS were modified to handle coke. This one will handle coke, oil or gas. Fig. 2.



BOWL TYPE MILL is used in pulverizing the coke. Each boiler is equipped with one.

ease of pulverizing of solid fuels in comparison with a coal chosen as 100. Materials softer than the standard have indexes higher than 100. Harder materials have a lower index.

The delayed petroleum coke handled in this installation has an average Hardgrove grindability index of 70. Bituminous coal averages 95-100. Anthracite coal has a grindability range of 22-60.

Pulverizers . . . Each boiler is equipped with a bowl type of mill. The mill consists essentially of a grinding ring, carried by a revolving bowl. Stationary rolls, preloaded by adjustable spring pressure, are set so that they do not come in contact with the ring. A classifier is located above the grinding chamber.

When the mill is in operation, a rotary feeder discharges coke into the spinning bowl where it is crushed by the rolls. A stream of heated air carries the fine coke, along with intermediate sizes, into the classifier. The classifier operates on the cyclone principle.

The coarser material is thrown to the periphery and refluxed back into the grinding chamber. The fineness of the coke passing to the burners can be regulated by controlling the quantity of reflux.

In addition to coke grindability and the fineness desired, a third factor, coke moisture, affects the capacity of the mill. The surface moisture must be removed from the coke fines so that they can be carried to the burners as dust by the air stream. The hot dry coke, refluxed from the classifier back to the grinding zone, is mixed with the wet incoming feed to promote drying. If the incoming coke moisture increases, the reflux must be increased. This decreases the capacity of the mill.

Mill capacity . . . The effects on mill capacity of coke grindability, moisture, and fineness are illustrated in Fig. 1. The example shown is for coke having a 62 Hardgrove grindability and containing 14 per cent moisture; the mill will pulverize 9,000 lb. per hour of coke so that 85 per cent will pass through a 200-mesh screen.

If the same coke is to be pulverized so that 90 per cent will pass through a 200-mesh screen, the mill capacity is reduced to 8,100 lb. per hour. The curves are typical only and do not depict the installed mill performance.

Fineness . . . The East Chicago fineness distribution was established at 99.5 per cent through 50-mesh, 93 per cent through 200-mesh, and 77 per cent through 325-mesh. This is very fine pulverizing, since the 325-mesh screen is finer mesh than an ordinary silk handkerchief.

Boilers Modified

The burners on the boilers were modified to handle pulverized coke, oil, and gas; either separately or in combination as refinery conditions might require. To insure good ignition 10 to 15 per cent of auxiliary fuel, either oil or gas, is fired in conjunction with the coke. A typical installation for handling pulverized coke, oil, and gas is shown in Fig. 2.

Firebox changes . . . The boilers were coke fired for several weeks with no firebox modifications. This was done to determine the feasibility of burning pulverized petroleum coke in completely black body fireboxes. Under these conditions firebox temperatures of 1,565°-1,600° F. were achieved.

The normal smoke emissions from the stack were in the range of 1 to 1½ Ringelmann for one boiler and 2 to 2½ Ringelmann for the other boiler. These values were within the maximum of 3 specified by the local smoke ordinance.

A 3-in.-thick plastic refractory lining was then installed on all four walls of the boiler fireboxes. This raised the rear wall firebox temperatures to 2,430° F. Under these conditions the stacks are clear and the boilers operations are excellent. Water circulation and load response are normal. The installation is satisfactory in every way. **End.**

NEEDED:

A cheap way to remove S from H_2S

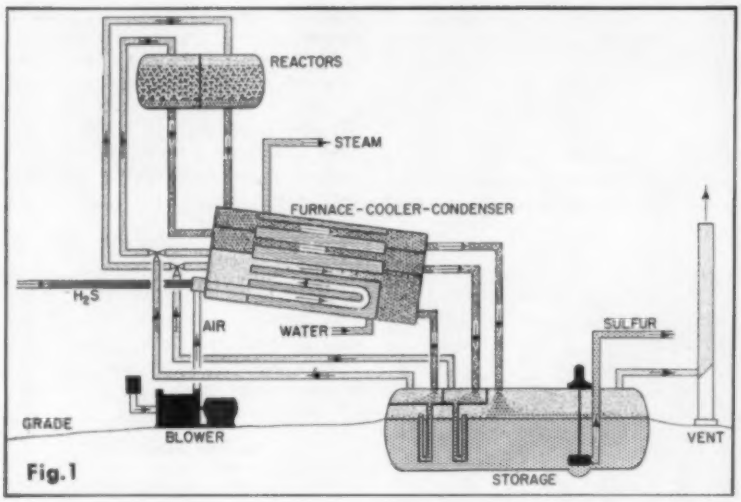


Fig. 1

By G. M. Franklin, L. V. Kunkel, and M. Webb

THE Claus process, used in this country since 1944, has until recently been generally uneconomical for plants where less than 20 long tons per day of sulfur could be produced. However, Pan American Petroleum Corp., which operates three other Claus type of plants, has designed and is now operating a small plant which is economical.

Licenses under this process are offered by Pan American Petroleum Corp.

Simplified Versus Conventional Plants

Fig. 3 is a simple flow diagram of a conventional Claus type of sulfur-recovery plant. The major pieces of equipment are the combustion air blower, furnace cooler, reactors, condenser, reheater, washtower ventstack, sulfur-storage pit, and pump for sulfur reflux and transfer. Some plants use a second condenser in place of the refluxed washtower.

Process . . . In the plant shown in Fig. 3, the total stream of acid gas enters the furnace with enough air to oxidize only one-third of the hydrogen sulfide to sulfur dioxide. Some plants have only one-third of the acid gas entering the furnace with enough air to convert all the hydrogen sulfide in that gas to sulfur dioxide; then combine the furnace stack gas with the remaining two-thirds of the acid gas ahead of the first reactor. In each case, sulfur dioxide reacts with hydrogen sulfide in the reactors to form elemental sulfur vapor, which is then condensed and drained to the sulfur storage pit.

Unreacted gases leave the first condenser below the minimum reaction temperature and must, therefore, be reheated (usually by a reheating or inline burner) before entering a second

Author Franklin is with Amoco Chemicals Corp. and authors Kunkel and Webb are with Pan American Petroleum Corp. Paper was presented at N.G.A.A. meeting, Billings, Mont.

. . . and here it is. Small plants, even those

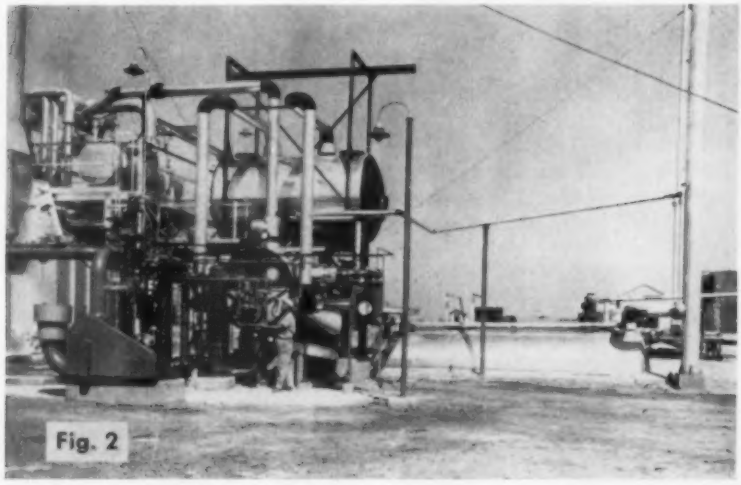
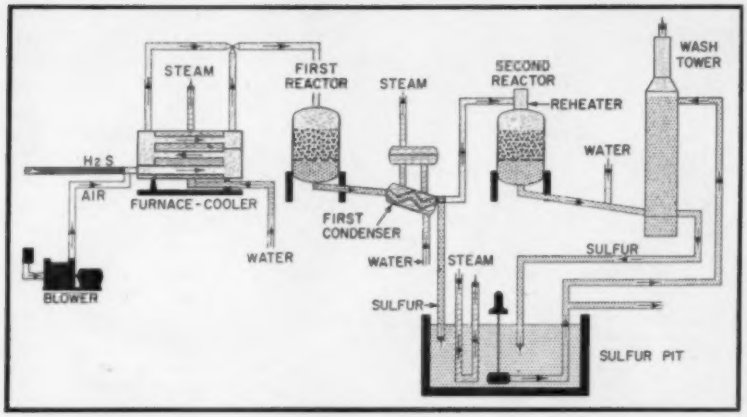


Fig. 2

with capacities of less than 12 tons per day, will find the new method to be economical. Plants with capacities up to 50 tons per day may be justified.

Thus, the new scheme will enable gas processors to remove H_2S gas and at the same time recover sulfur, one of our most important industrial chemicals.



CONVENTIONAL SULFUR PLANT makes use of the Claus process. Fig. 3.

reactor. Final condensation of the elemental sulfur occurs in the wash-tower. This was accomplished originally by injecting water into the inlet gas stream as it entered the wash-tower. Severe corrosion in the wash-tower, however, made continuation of this practice unfeasible, and a water-cooled reflux condenser was installed in the sulfur reflux line.

Reaction or heat removal . . . Fig. 3 reveals that a majority of the equipment is used either for reaction or for heat removal. Therefore, within the limit of practical sizes, the plant can be simplified by combining all heat removal in one piece of equipment and the reactors in another single unit. These concepts provided the basis for designing the simplified sulfur plant shown in Fig. 1.

The major pieces of equipment in that unit are the combustion air blower, combination furnace-cooler-condenser, combined reactors, ventstack, separator-storage drum, and pump for sulfur transfer. The process is basically the same as in conventional sulfur-recovery plants. The total stream of acid gas enters the furnace with only enough air to oxidize one-third of the hydrogen sulfide to sulfur dioxide. The reactors and condensers perform the same functions as in a conventional plant.

Furnace-cooler-condenser . . . Some conventional plants have an additional cooler between the furnace and the first reactor to condense and remove sulfur formed in the furnace. This improves conversion in the reactors. However, the gases have to be reheated before entering the first reactor, and the additional cooler and reheater are expensive.

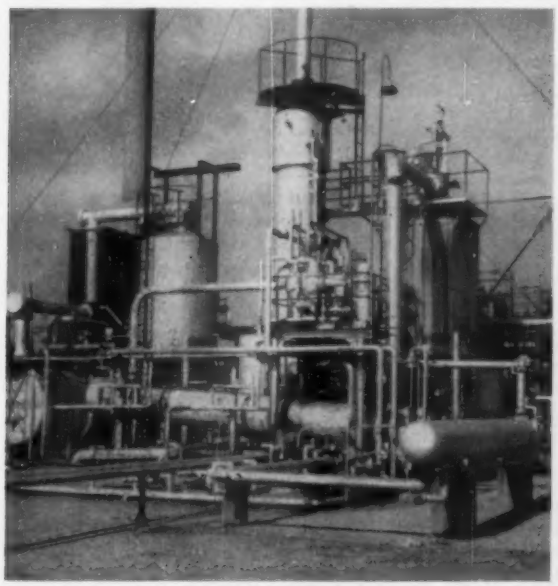
In the simplified plant, this cooling and reheating is done without a separate condenser or reheater. The necessary cooling is accomplished with heat-transfer surface in the final pass of the section designated as cooler in Fig. 7.

Condensed sulfur is removed from the cooled gas in the first compartment of the separator-storage drum. The cooled gas is reheated to proper temperature for the first reactor with hot gas which is bypassed around the last pass of the cooler through a three-way valve.

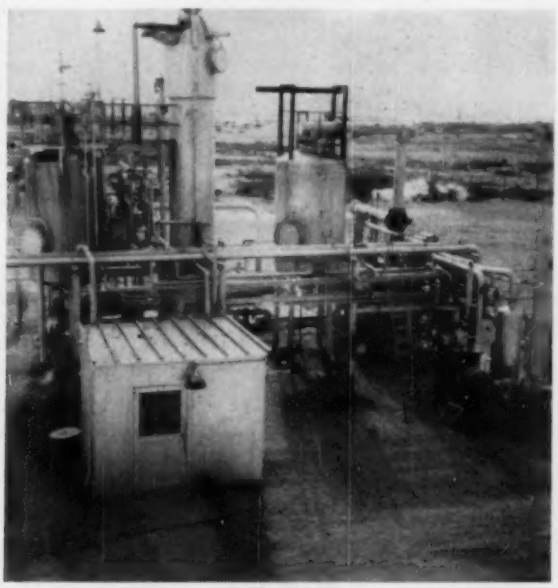
The sulfur produced in the first section of the combined reactors is cooled and condensed in the first condenser section of the furnace-cooler - condenser unit (Fig. 1 and Fig. 7). Liquid sulfur and gas are separated in the second compartment of the separator-storage drum. The gas is then reheated with bypassed gas similarly to the furnace effluent and passed through the second section of the reactor.

After leaving the reactor, the stream is cooled and the sulfur is condensed in the second condenser section of the furnace - cooler - condenser. The cooled stream passes through the separator-storage drum where the sulfur drops out and the gases pass on to the ventstack. Heat is removed from the various streams by generating 20 to 50 psig. steam in the furnace-cooler-condenser unit.

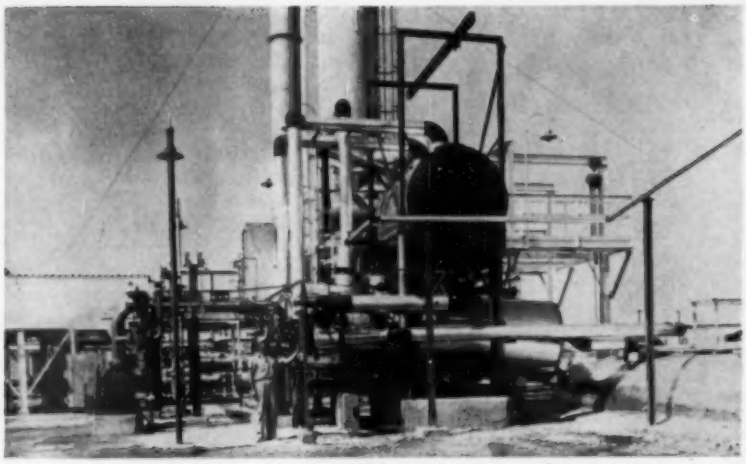
Mechanical . . . Figs. 4 and 5 are



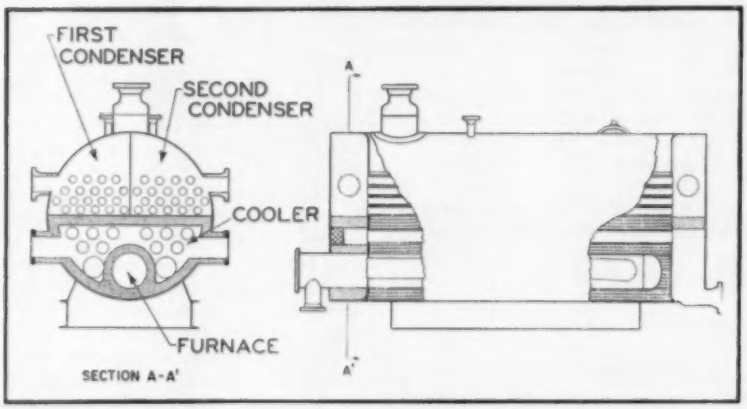
CONVENTIONAL SULFUR PLANT which recovers 18 tons per day. Fig. 4.



CONVENTIONAL SULFUR UNIT as viewed from the control room side. Fig. 5.



SIDE VIEW of a sulfur-recovery plant of the simplified design. Fig. 6.



FURNACE COOLER AND CONDENSER for the new design are all combined into a single piece of equipment. Fig. 7.

photographs of a conventional Claus sulfur-recovery unit which recovers 18 long tons per day. The complexity of equipment and piping is well illustrated. Fig. 4 shows the storage pit is below grade in the foreground, and the two vertical reactors with the vertical washtower between and the horizontal furnace-cooler at left.

The reheater may be seen on top of the reactor on the right. The two long horizontal vessels in the foreground are the condenser (center) and reflux cooler (right). Fig. 5 is a view from the control-room side. The combustion air blower is in the right foreground next to the inlet scrubber (which is not shown in Fig. 3).

Compactness . . . By way of comparison, the compactness of the simplified design is easily seen in Figs. 2 and 6. Fig. 2 is a front view. In the center of this figure in a horizontal position are the combined reactors mounted above the combination furnace-cooler-condenser. To the right and at ground level is the partially buried horizontal separator-storage tank. To the left is a boiler and other apparatus that serve the plant's amine regenerator.

Fig. 6 is a side view. The combustion air blower is to the left. Immediately below the elevated reactors is the sloped combined furnace-cooler-condenser. To the right at ground level is the separator-storage tank. Figs. 2 and 6 illustrate the compactness of the unit, the flexibility built into process lines, and the slope provided to make all units self-draining to the storage tank.

Fig. 7 shows how the furnace, cooler, and condenser are combined into a single piece of equipment, thereby eliminating much of the piping, instruments, and space normally required. This unit is essentially a four-pass marine type of boiler with intermediate takeoffs for combustion products as shown in Fig. 1.

Combining the two reactors into one shell, as shown in Fig. 8, also simplified the piping. Supports were minimized by mounting the reactor vessel above the furnace-cooler-condenser. Then to further simplify construction, separating compartments, storage and pumping facilities were combined in a separator-storage drum as shown in Fig. 9.

All process piping is sloped to drain liquid sulfur from the various parts of the unit to the storage tank. These lines carry hot gases also, thus eliminating the need for the conventional drain system which requires expensive steam-jacketed lines and valves. Passing hot process gases through the various compartments of the separator-storage drum (see Fig. 1 and Fig. 9) insures that operating temperatures therein are maintained above the melting point of sulfur.

Having the separating and storage functions in one tank also minimizes piping problems. Though pipe runs in other sections are short, adequate provisions for expansion and contraction is achieved through proper location of the pipe connections on equipment.

The steam generated in the furnace-cooler-condenser is condensed in the reboiler of an adjoining amine reactivation unit. The furnace-cooler-condenser is set low enough to provide sufficient head for a closed gravity-flow condensate return system operated by a level controller. This eliminated the usual boiler feed pump, but necessitated installation of the separator-storage drum partially underground.

The drum is supported by simple concrete saddles and a sand pad which insulates the bottom. The top half of the tank has 2 in. of insulation covered with an aluminum jacket. The area adjacent to the tank is covered with a concrete mat and sloped to drain surface water away from the tank.

Instruments and controls . . . These are relatively simple. No pressure control valve is used in the acid gas inlet line since the sulfur plant will, when operating, handle all acid gas available to it. If the sulfur plant is down, excess pressure in the inlet line is bled directly to the ventstack through a pressure controlled reducing valve. A ratio flow controller measures the flow of acid gas and controls the amount of combustion air accordingly.

Air in excess of that required for sulfur production is bypassed to the atmosphere from the discharge of the constant-speed, positive-displacement blower. Safety devices are provided to shut down the unit in case of power failure, low-water level, or insufficient flow of either acid gas or combustion air.

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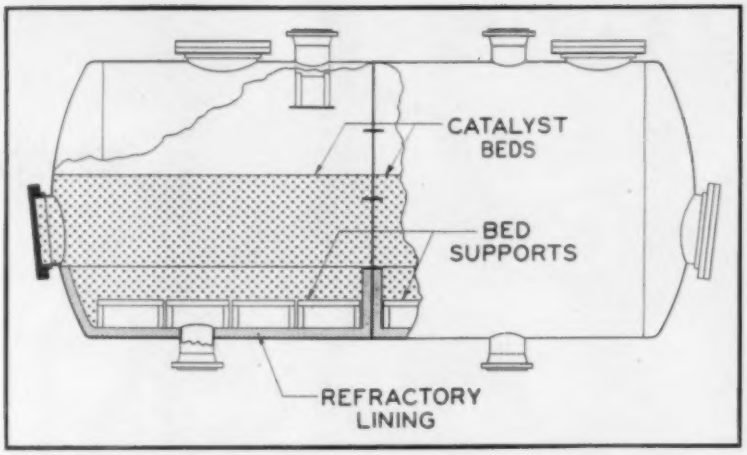
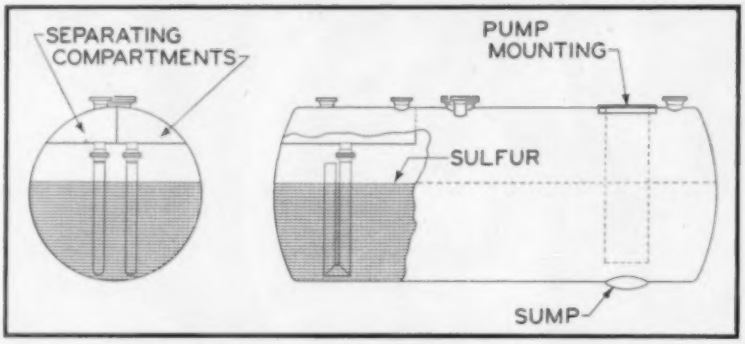


COMBINING TWO REACTORS into one shell also simplifies the piping. Fig. 8.



COMPARTMENTED STORAGE TANK contains storage and pumping facilities. Fig. 9.

How corrosion is minimized . . . Corrosion caused by high-temperature sulfiding is minimized in this unit by utilizing water-cooled surfaces in high-temperature zones of the furnace-cooler - condenser. Experience with conventional plants has disclosed that corrosion will occur in equipment where water is injected for cooling. It will also occur where water condenses on cool metal surfaces and on those metal surfaces which are covered with enough internal insulation to lower the surface temperature below the dew point of water.

These problems have been avoided in the simplified unit by eliminating water injection for cooling and by externally insulating the reactors, lines, and storage tank in order to maintain metal surface temperatures above the dew point of water. As previously mentioned, steam-jacketed lines and their accessories have been eliminated, which also reduces maintenance costs.

Costs . . . Estimated investment costs for the simplified plant are about one-half of those for conventional sulfur plants. Pan American personnel performed all engineering, purchasing, and supervision of field construction, and the plant was installed with oilfield contract labor. Based on Pan American's experience with conventional sulfur plants, maintenance costs for the simplified plant should also be substantially lower.

A preliminary comparison indicates that, for the first 4 months of operation including the startup (which is usually expensive), maintenance costs on the simplified plant averaged 18 per cent lower than the average for normal operation of a conventional plant during the entire year of 1956.

Operating experience . . . The plant was started without difficulty and continues to operate most satisfactorily. Recovery is currently averaging 93 per cent (based on the acid gas in the feed) which equals or betters the recoveries achieved in Pan American's conventional plants. The operators (some have operated a conventional plant) report that the simplified unit requires far less attention than does a conventional plant. Only part of one man's time is required to operate the plant and to load liquid sulfur into transport trucks. Thus, the operator has time left to also operate an adjacent amine reactivation unit, amine reclaimer, dehydrator regeneration unit, auxiliary boiler, and cooling tower.

Acknowledgment

The authors express their appreciation to Pan American Petroleum Corp. for permission to publish this article and to those groups within the company without whose cooperation and interest this work would not have been possible.

Nelson Refinery-Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained October 1, 1956 (page 110) as well as the Indexes of Individual Items of Equipment that appear on the COST-imating page in the first issue of the months of January, April, July, and October.

Index (1946=100)

	1949	1952	1954	1955	1956	July 1957
Pumps, compressors, etc.	135.9	155.6	166.5	172.2	192.0	204.1
Electrical machinery	130.9	152.4	160.0	162.5	175.0	188.6
Internal-combustion engines	124.8	146.5	150.5	153.2	164.0	173.5
Instruments	123.1	146.2	154.6	162.9	182.1	186.2
Heat exchangers	133.0	165.8	171.7	156.8	190.7	209.0
Miscellaneous equipment average	*121.6	153.3	160.7	161.5	180.5	192.3
Materials component	143.6	164.3	174.6	176.1	190.4	204.9
Labor component	137.1	163.1	183.3	189.6	198.2	209.7
Nelson construction index	139.7	163.6	179.8	184.2	195.3	207.8

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the miscellaneous equipment items shown above.

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BP AND THE GEOPHYSICAL YEAR

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Problems of Multiphase Pipeline Flow

By Dr. John M. Campbell

Chairman, School of Petroleum Engineering,
University of Oklahoma

THE DEVELOPMENT of high-pressure gas-condensate and volatile oil fields has accented the problem of multiphase flow in gathering systems. The use of a single line to handle both gas and liquid is quite attractive economically, particularly for offshore wells.

Much work done . . . The design of such systems, however, has proven to be difficult, for widely accepted correlations for single-phase flow have proven inadequate. Consequently, there have been numerous investigations of this problem in recent years.

In spite of this drawback, though, adequate systems are being designed by use of what might be considered semiscientific methods plus some judicious guesses. As usual, the net result of this approach results in a working system that, if anything, is probably oversized, so as to provide a safety factor that will counteract potential errors.

Fortunately, the end result is a pipe size that is to give a certain pressure drop for given flow rates. The fact that pipe only comes in certain sizes therefore affords an automatic safety factor. If the calculation, for example, indicates that a 3.2-in. internal diameter is needed, one must necessarily specify 4-in. nominal diameter pipe of the proper wall thickness to handle the absolute pressure.

The real limitation of present knowledge, therefore, is not the fact that a workable system may be designed, but simply that one cannot be sure it is the best or optimum system from an economic standpoint.

Visual studies in transparent pipe [4 5 26 44 56] etc.) have shown the general behavior of the fluids under varying flow conditions. It has been found that the liquid and gas have different amounts of interaction and flow in a different manner as the mass flow rate or velocity of a given liquid and gas are varied.

Flow patterns . . . The following general flow patterns have been found by various investigators, although various descriptions have been used:

1. Bubble flow—bubbles of gas move along the upper surface of the pipe.
2. Plug flow—many bubbles coalesce to form gaseous plugs which fill a large part of the cross-sectional area.
3. Laminar flow—gas moves along the upper portion of the pipe and the liquid along the lower portion, with a rather smooth, continuous interface.
4. Wavy flow—laminar flow except with some wave action noted.
5. Slug flow—the tops of the waves seal the tube and are carried along with much turbulence.
6. Semiannual and cresting flow—the transition regions preceding annular flow at low and high liquid rates, respectively.
7. Annular flow—a liquid film covers the entire wall with spray usually present in the gas phase.
8. Spray flow—liquid is completely dispersed in the gas.

While knowledge of these flow patterns is of undeniable value in preliminary research, it is little help in practical design. In a given line, many, if not all, might be present at different points. For example, liquid collecting at low points would change the liquid-gas rates and thus the flow pattern. The situation is further complicated by the inability to see into the pipeline and the fact that the above regions may not be rigorously expressed in terms of readily measurable data.

Pressure drop . . . The pressure drop is always higher than that for a single fluid system. Field data in lines attendant to a gasoline plant have shown that pressure drops are from two to three times as high as that predicted using gas-flow equations, even though gas is the predominant fluid. In fact, the writer has designed several systems on a "rule-of-thumb" basis, using a factor of three, in which calculated and actual pressure drops checked quite well.

It is understandable why the pressure drop should be higher, for in single-phase systems the primary pressure drop results from friction between the fluid and wall with intrafluid shear stresses playing some part. In multiphase flow, pressure drop stems from frictional losses, momentum changes, head effects, energy consumed in changing surfaces (waves, etc.), and compression and expansion of the gas.

Any of these factors may be dominant, depending on flow geometry, pressure, and relative flow rates. The pressure drop must, further, be higher for a single phase, because less of the cross-sectional area is available for its flow.

Regardless of the flow mechanism, the velocity of the gas phase is higher than that of the liquid phase. There is, therefore, some interfacial transfer of energy.

For all of these reasons, the design of multiphase systems must be approached with caution. The following references will be of value to one facing this problem.

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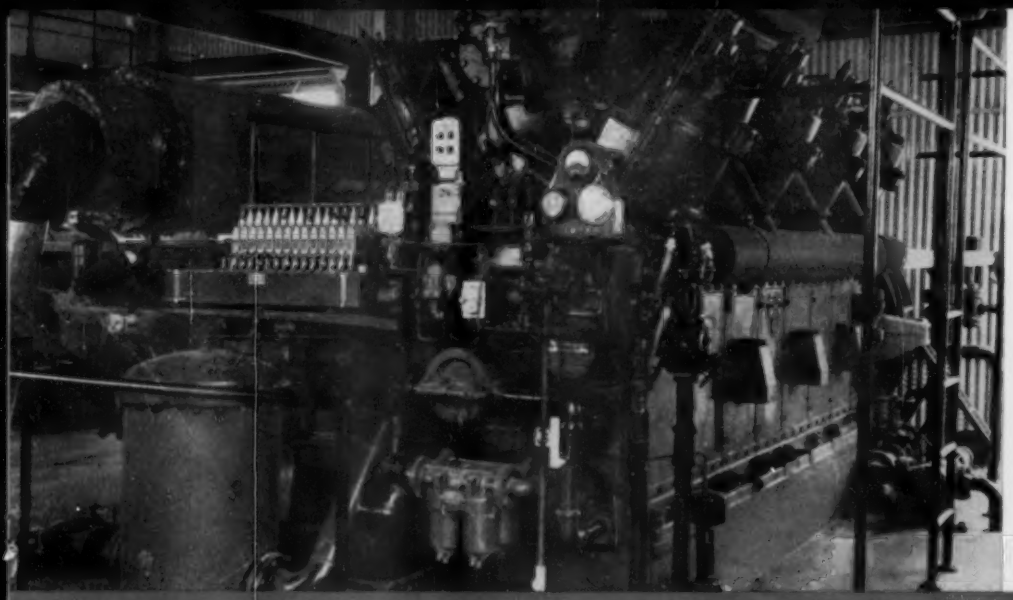

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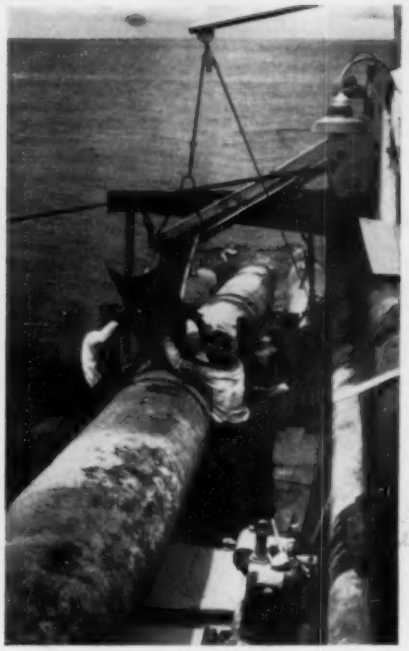
Here's a construction view of stinger before being . . .



. . . attached to lay barge

New Pipe-Launching Device Lowers

By Larry Resen
District Editor

TWO BIG HAZARDS in offshore operations are cracking the concrete weight coating and buckling of the pipe through excessive bending. This new development by Brown & Root, used on the 60-mile C.A.T.C. gathering system off Louisiana, is designed to guard against both, by closer control of the slope of the pipe as it is launched.

The new pipe launcher uses the "stinger," a two-pronged device pivoted to the end of the barge and used to cradle the pipe on its way to the gulf bottom.

The new barge is the M-211, a 300 by 60 by 19-ft. craft, especially rushed into service for this job. The M-211 actually is still incomplete and during the winter lull, will be fully outfitted to include crew quarters. It was used along with two other Brown & Root barges in laying the offshore lines.

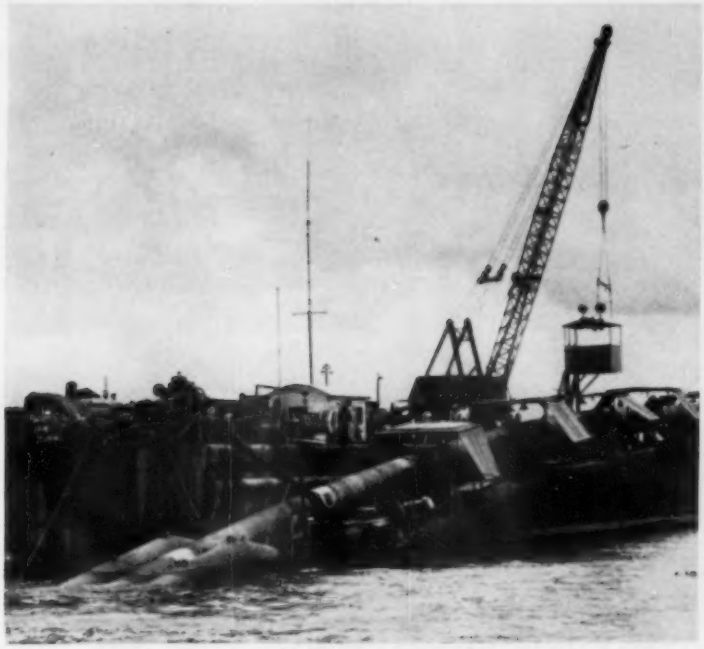
The pipeline grid includes pipe ranging upwards from 12 to 26-in. and will be used to tap offshore gas reserves from six blocks of the C.A.T.C. group and Magnolia-Continental-Newmont's Block 64. This gas will enter Tennessee Gas Transmission Co. main lines traversing inland Louisiana. Biggest link in the grid is the 25 miles of 26-in. running from shore to the gathering platform in Block 49, East Cameron area. Smaller lines from other platforms in outlying blocks converge at this juncture and include 35 miles of 12, 16, and 30-in. pipe.

Present methods, problems . . . The pipeliners were faced with the prospect of laying the pipe in waters up to 60 ft. deep. In normal practice, the pipe is laid via the "stove-pipe" method. A joint at a time is made up on the barge and the pipe enters the water at the end of the barge. Each successive joint is submerged as the barge inches forward. The pipe is weight coated with a concrete-aggregate mixture to offset its natural buoyancy, and it is desirable to prevent this coating from becoming cracked. Otherwise marine organisms can penetrate to the pipe metal itself and cause considerable damage. Its naturally quite important to prevent the pipe from bending from the time it leaves the end of the barge until it rests on the bottom of the sea.

A common practice has been the use of buoys attached to the section of pipe between the barge and the sea floor. Several buoys are spaced along the pipe and their purpose is to support it at a constant slope. This naturally has the inherent disadvantage that as one section of pipe reaches bottom, the buoy has to be cut loose, and another buoy attached to the joint just leaving the barge. The buoys have to be continually attached, released, and recovered. At the same time, the apparent weight of the pipe changes along its length and this complicates the buoyancy problem.

Thus, the section just entering the water weighs the most, an intermediate section is buoyed up by its displacement and it weighs less, while a section near the bottom is partially supported by the pipe resting on the bottom. Added to this is the problem of ground swells. If these become too extreme, through the action of buoys, they will tend to make the pipe ride up and down and can even contribute to bending of the pipe.

How stinger works . . . The stinger was developed as a new technique in pipe launching. The stinger used on the M-211 consists of two lengths of 30-in. pipe tied together by 12-in.



Here it is in service, its pivoted end exposed.

And here's a closeup view.

Pipe Gently, Guards Against Damage

cross members. The 352-ft. launcher is equipped with dollies underslung between the two 30-in. prongs. The launcher is attached to the rear of the barge and is free to pivot in an up and down movement.

The actual position of the stinger will depend primarily upon weight of the pipe and the buoyancy imparted to the stinger. The stinger's buoyancy can be controlled by watering or dewatering several compartments in each of the 30-in. prongs. In this manner the stinger can be made to assume any desired slope. In addition, the ballast of the barge can be shifted so that the pipe leaves the barge at any desired slope. This ballast shift would affect the normal 17° slope imparted to the pipe by the inclined work ramp.

The pipe can thus enter the water at any desired angle and travel along rollers all the way to the sea floor. The rollers are spaced to adequately support the pipe and also permit it to move freely. In shallow water, the length of the stinger is such that it will drag along the bottom. As deeper water is entered, the stinger will float with its buoyancy controlled as desired. The buoyant effect depends upon how much water is permitted into each compartment. A valve system is used to admit water or to admit compressed air, which displaces the water as required. The M-211 equipped with the stinger has been able to average about 80 joints of pipe per day in the offshore water.

Barge equipment, operation . . . The pipelaying barge, M-211, was constructed by Todd Shipyards, Inc., and outfitted by Brown & Root. It is equipped with an over-the-side work ramp, which enters the water at a slope of 17°. The floor of the ramp is steel grating, which provides a safe work space and still reduces the weight on the outboard side of the barge. Seven roller cradles spaced along the ramp support the pipe and permit it to roll freely as the barge is moved.

Seven platforms are also located along the ramp at which various operations are conducted. Five of these are welding stations, one is used for applying dope, and the last is where field joints are completed. Concrete aggregate is mixed aboard the barge and poured around these field joints to provide a continuous weight coating to the completed pipeline. Ballast is used to counteract the additional weight of the pipe on the over-the-side ramp.

The M-211 is equipped with 13 welding machines strategically spotted around the deck. Most of these are located on the far side of the barge away from the work ramp. Conduits are used to contain the necessary cables, and welding stations are equipped with receptacles to which welding leads are connected. This minimizes the amount of free cable lying about.

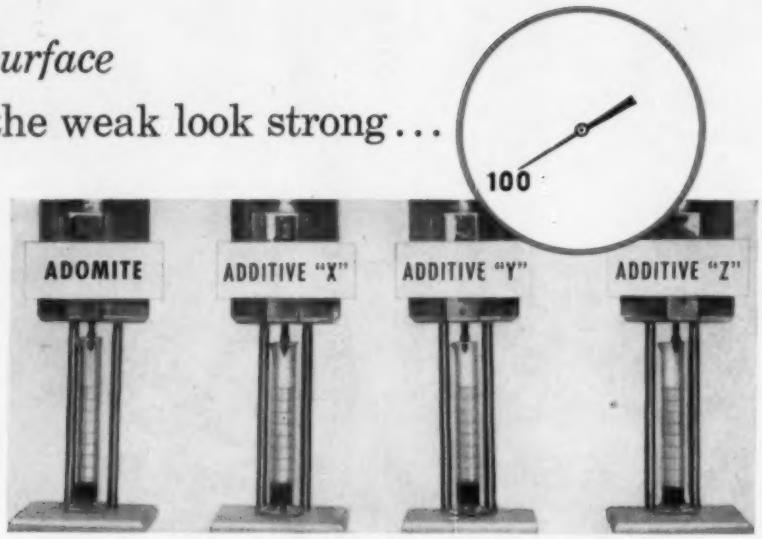
A side-boom tractor at the forward end of the barge lines up the pipe joints for the stringer bead. A crawler crane is used for general lifting purposes, and 3-in. wood decking extends along half the barge so the crawler can travel its full length. The big job for the crawler crane, of course, is transferring pipe joints from a supply barge alongside to the pipe rack at the forward end of the barge.

The barge is moved forward by taking up slack on four forward-anchor cables and releasing slack on four rear-anchor cables. An attendant tug relocates the anchors in progressive fashion. Four two-drum winches handle the anchor cables. Operation of the winches is directed from an elevated platform located above the work ramp. The foreman here is in a position to watch the work on the pipe as well as have a clear view of the barge and the tugboat working the anchors.

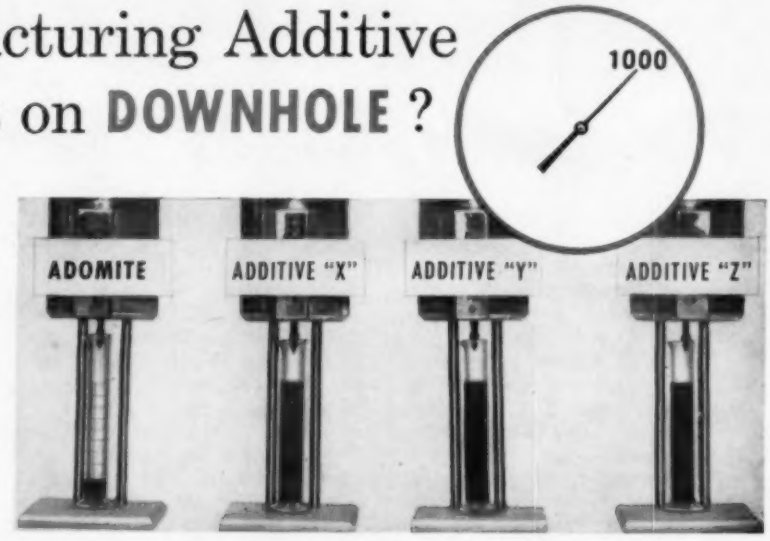
On this particular job, Brown & Root has three barges at work. The M-140 and the Sample No. 2 have been working one 12-hour shift while the M-211 has been working two 12-hour shifts. All three are equipped with the stinger. Coy Spears is spread foreman on the job. Barge foremen are: Norman Beeson, and J. W. Clawson, M-211; Chester Pool, M-140; and B. I. Hoke, Sample No. 2. **End.**

On the surface

even the weak look strong...



but which Fracturing Additive can you count on **DOWNHOLE**?



Some fluid loss control additives act impressively at surface conditions of low pressure and room temperature. But downhole, they let you down... with fluid loss becoming so high that their effectiveness is lost. That's what distinguishes Adomite from other fluid loss control additives. You can count on Adomite for *deep-down* effectiveness.

What's the secret of Adomite's *deep-down* effectiveness? Adomite, when mixed with oil, disintegrates into millions of tiny particles. These particles seal the face of the formation and keep the fracturing fluid from filtering in. Temporarily sealing the formation, Adomite particles do not plug it.

Where do other additives fail? These likewise contain sealing particles, but tend to soften or dissolve as temperatures increase. Consequently, fluid loss control is greatly reduced.

To be sure of least fluid loss, tell your service company to fracture with Adomite.

	Fluid Loss at Surface Conditions— 100 psi,* 75°F., cc/30 min.	Fluid Loss at Bottom Hole Conditions— 1000 psi, 150°F., cc/30 min.
Adomite plus crude oil	**2.2**	**22.0**
Additive X plus crude oil	**37.8**	**Infinite**
Additive Y plus crude oil	**8.5**	**Infinite**
Additive Z plus crude oil	**13.0**	**295 (1 min., 50 sec.)**

* Standard API Code 29 Test

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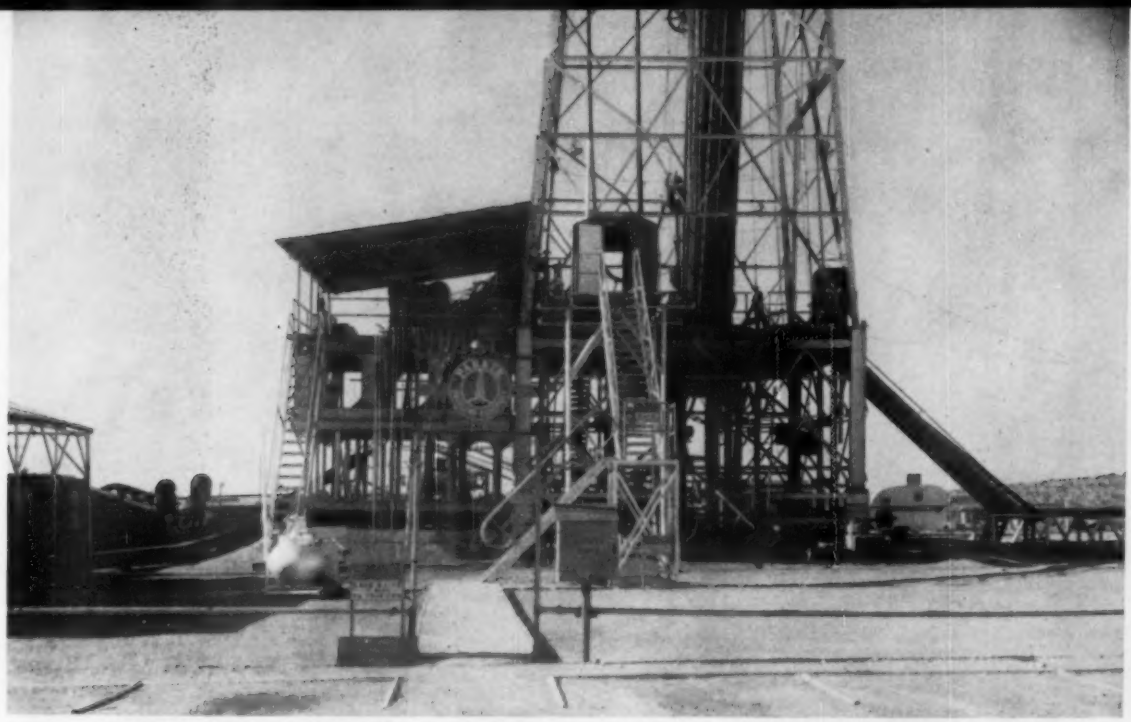


Parker Drilling Co. Rig 26 (Fig. 1) reaches new depths. This

Record-Breaking Rig Is Electric

By J. O. Scott

Electric power gives this rig the flexibility needed for deep-hole drilling. Here's the complete setup and working layout.

RIG 26 of Parker Drilling Co. is getting a reputation as a record breaker. In its first two holes it broke both the Oklahoma and the Texas depth records. Its record in Oklahoma has since been passed, but its recent Texas record of 21,663 ft. should stand for awhile.

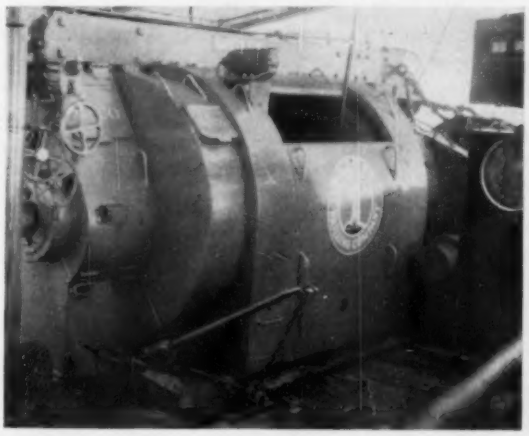
Rig 26 is electric. It is the type of rig Parker considers best for deep drilling. Here is why:

- Deep holes take big power and result in heavy loads. Electric drive gives smooth application of power and smooth handling of loads. The right amount of power is available for any load and any speed without gear changes.
- Transmission is flexible with electric power. Alignment of engines with draw works and pumps is no problem. Transmission losses are low and there is very little maintenance to an electric cable transmission.

Parker's confidence in the electric drive is well founded. The rig made good time in drilling the deep Pecos County, Texas, well for Pan American Petroleum Corp. In 311 days, the 1-CS University cracked the old Texas record of 19,060 ft. It reached the record depth of 21,663 ft. in 397 days.

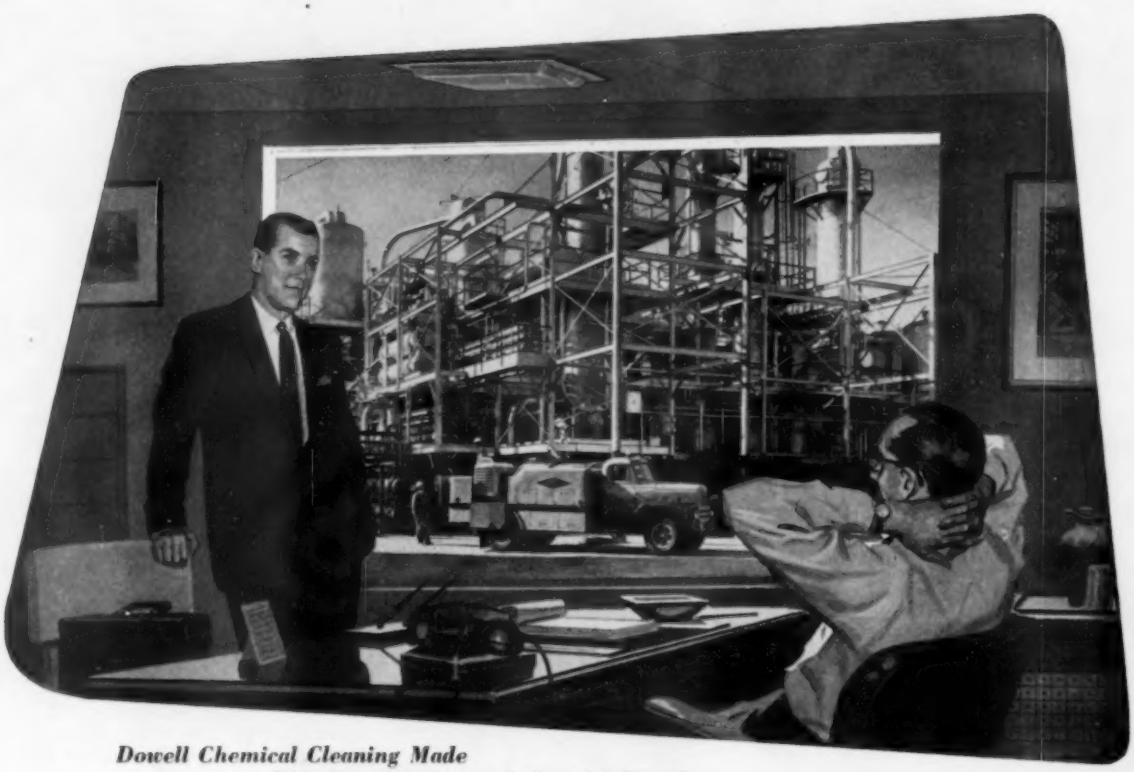
What it takes . . . Fig. 1 shows what it takes to drill a record-breaking well. The rig was set on a 22-ft. substructure to be sure to accommodate blowout preventers. Space was also provided for an air-drilling head, although it wasn't used on the well. Three gate-type preventers and one rotating type were used. Notice the blowout-preventer accumulator in the foreground. It is quick acting so that it can be tripped on the run.

The 136-ft. derrick has the highest capacity of any inland drilling rig. It is a hurricane type with double-thick legs and has a capacity of 1,200,000 lb. It is similar to derricks



DRAW-WORKS CONTROL for Rig 26. The draw works is essentially like that found on a steam rig. Fig. 2.

how would you like to add $250,000.00 to your profit?



Dowell Chemical Cleaning Made This Possible for an Industrial Plant!

In 1954 an East Coast plant employed Dowell Chemical Cleaning Service on a limited basis. The results were encouraging.

In 1955 the same company expanded its use of chemical cleaning. The results were startling. More throughput, less down time, and greater overall plant efficiency effected nearly a *$250,000.00 saving!*

In 1956 the program was continued. The result: still more savings. Eventually, chemical cleaning on a continuing year-around basis is expected to effect savings of from $300,000.00 to $500,000.00 annually.

This case history is about an oil refinery. However, Dowell has eye-opening performance data to show you in almost any industry.

Dowell engineers are experts in the use of solvents to remove scales and sludges—those deposits that cut the capacity of process and steam generating systems. Dowell does the job for you and furnishes all necessary chemicals, trained personnel, pumping and control equipment.

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25 years forward

clean it chemically

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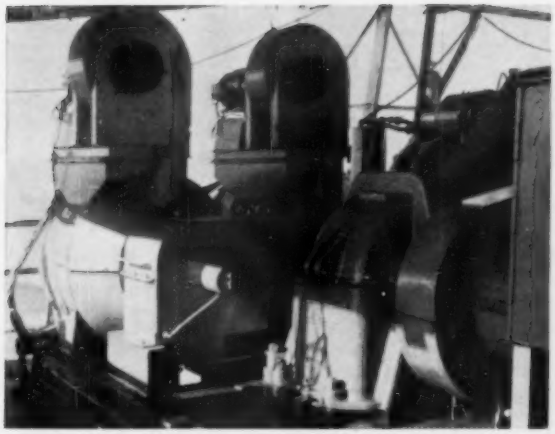
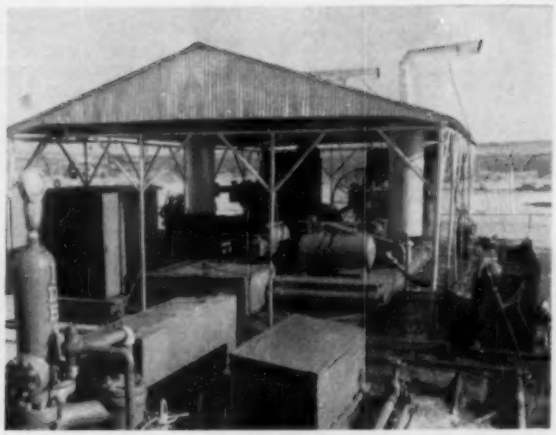
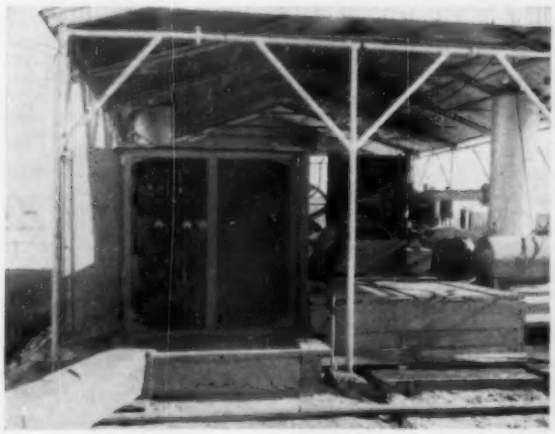


TWO ELECTRICAL MOTORS drive the draw works. The two d.c. motors are compounded outside the draw-works frame. Fig. 3.



ENGINE SHED of the rig shows two engines compounded and three generators driven off compound in an unusual arrangement. Fig. 4.



ELECTRICAL-EQUIPMENT CONTROLS were designed by the engineering department of Parker Drilling Co. Fig. 5.

MAIN MUD PUMPS on the rig. The wooden channels contact the electric conductors. Fig. 6.

used on offshore platforms and, in fact, was previously used offshore.

Another feature may be seen in Fig. 1 that has an intangible yet noticeable effect on operations. That is the cleanliness of the location, the safety signs, and the hard hats for visitors. These help boost the pride of crews in their rig and promote over-all efficiency.

Much like steam . . . The steam rig has always been a favorite of drillers because of its ease of operation and sensitivity of control. The electric rig is the same way. The similarity is particularly close with Rig 26 because the draw works is a steam draw works that has been converted (Fig. 2).

This type of draw works was selected because of its heavy-duty rating and because of its simplicity of construction, which minimizes maintenance and breakdowns.

The rig is a National with a steam designation of 23-10½ equivalent to a National 130 in power.* As Fig. 2 shows it still has the speed controls of the steam rig. Only now these controls regulate the speed of the electric motors driving the draw works and the mud pumps.

Driller's electrical panel is on the draw works. This contains the switches and throttles that assign the power to the various loads. Included on this panel is a safety switch that shuts down the entire rig in emergencies.

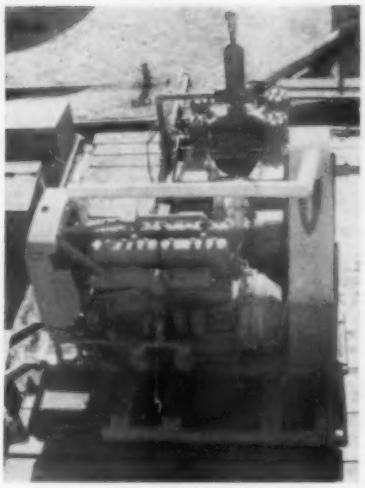
Two electric motors drive the draw works. These are shown in Fig. 3. A high-speed chain connects them. The motors are conservatively rated at 300 hp. each, but will operate satisfactorily at 100 per cent overload. This makes 1,200 electrical horsepower available to the draw works.

*Although this steam draw works has been in service several years, it is now being manufactured again by the National Supply Co. as a draw works for an electrical bridge.

Generator package . . . Electric power for Rig 26 is furnished by two Waukesha V-12 gas engines driving three Westinghouse generators. The power skids are shown in Fig. 4. The V-12's have a horsepower rating of 1,000 hp. each. The generators are rated at 500 hp. but may be operated at 100 per cent overload for a total possible power output of 3,000 hp.

As shown in Fig. 4, the engines drive the generators through a compound. This design permits the power group to form three skids, each weighing below the permit load for Oklahoma. (The rig was put together for Oklahoma drilling.) An engine-generator combination would require a special road permit as a single package. Belts are used in the compound to take up any shock that might arise from the three loads on the two engines.

Special design . . . Controls for the electrical equipment are shown in Fig.



AUXILIARY MUD PUMPS of Parker's Rig 26. Fig. 7.

5. This master switchbox and all controls were designed by Parker Drilling Co.'s own engineering department. Both motors and generators were obtained as surplus equipment and required special design for drilling requirements.

Controls are set normally for one of the generators to furnish power continuously to the mud pumps. The other two generators furnish drawworks power. When the draw works isn't operating, these generators can then be switched over to the mud pumps.

While hoisting requirements grow large with hole depth, Parker feels that the greatest amount of power is actually needed for the mud pumps in the upper part of the hole. Hole size here is usually very large and takes a lot of mud circulation. When the hole becomes deep, hole size and thus volume are reduced enough to decrease power requirements for pumping even though pressure goes up.

Pumping power . . . Parker started the 1-CS University with three mud pumps, rated at 900, 600, and 300 hp. at 16,478 ft., 7⅞-in. casing was set and drill pipe was reduced from 4½ to 3½-in. This reduced the pumping power needed so the 900-hp. pump was pulled off for repairs and replaced by a 600-hp. pump. Fig. 6 shows the two 600-hp. pumps driven by electric motors.

The pump motors shown in Fig. 6 are the same size and can be interchanged with the generators. Both are shunt-wound. Note that the electrical cables connecting the motors to the generators pass through wooden conduits. Such conduits are necessary to protect the cables from wet ground and accidental cutting or damage.

Fig. 7 shows the 300-hp. standby pump which is driven by a separate gas engine. Small gas engines also drive rig auxiliaries.

High cost of deep holes . . . Deep drilling is expensive. The cost of putting Rig 26 together was about a million dollars even with the old draw works and war-surplus electrical equipment. Current price of such electrical equipment is now about five times as high.

Besides the heavy equipment, deep holes require special drill pipe. Parker used vanadium drill pipe in both 4½ and 3½-in. sizes. Allowing for some extra fishing loading, Parker estimates the 4½-in. vanadium pipe can be used to 18,500 ft. and the 3½-in. pipe can be used to 26,000 ft.

When deep holes come along, Parker is going to be ready. Using the experience gained with Rig 26 he has put together an even heavier rig now working in Oklahoma. Others are planned. All will be capable of setting new depth records. **End.**

BOOKS

THE FEDERAL LANDS: THEIR USE AND MANAGEMENT by Marion Clawson and Burnell Held. Published by Johns Hopkins Press, Homewood, Baltimore 18, Md. 500 pp. $8.50.

Within the past decade the use of federal lands has become big business. The shift was so great and so sudden that many of the methods of managing the lands are now seriously out of date. The authors examine the most important of these changes in this new book, tell how they came about and what they may mean for the future, and discuss some of the alternatives for dealing with them.

Federal lands include national parks, national forests, wildlife refuges, grazing districts, and submerged areas of the outer Continental Shelf. This book is concerned with how these lands are used and managed from an economic viewpoint. Particular attention is given to revenues from the expenditures on them.

According to data given in the book, the total number of oil and gas leases upon the public domain has risen from less than 5,000 in 1942 to slightly over 100,000 in 1956. Leases for outer Continental Shelf areas also are discussed.

SUBSURFACE GEOLOGY OF NORTHWESTERN ARKANSAS, by William M. Caplan. Published by Arkansas Geological and Conservation Commission, Little Rock, Ark. Price, $1.50.

The oil industry will welcome this new publication on the geology of northwestern Arkansas. At the present there is considerable interest in this area because of its gas production and its suspected oil possibilities. The report contains an excellent summary of the stratigraphy and structure. The author concludes that the oil possibilities of northwestern Arkansas are good, particularly in the pre-Pennsylvanian rocks. Numerous unconfirmed shows of oil have been reported although no commercial production exists in northwestern Arkansas at the present time. The principal gas-producing formation is the Atoka, and there is an active drilling campaign going on at the present time aimed at developing these sands. Production is related to both stratigraphy and structure.

The report is exceptionally well illustrated. The maps show the principal structure axes, key well locations, and regional isopachs in the principal formations.

HISTORY OF THE ROYAL DUTCH PETROLEUM CO. Published by E. J. Brill Co., Oude Rijn 33a, Leiden, Holland. Four volumes. Price, 120 guilders ($45.00).

This is a magnificant petroleum historical account, weaving together the history of oil on an international basis and the start and upbringing of the Royal Dutch petroleum group. The author is the distinguished Dr. F. C. Gerretson, professor of constitutional history, University of Utrecht.

Vol. 1 contains six chapters, 287 pages, and starts with the first Dutch report of the appearance of petroleum in Sumatra, written in 1596. This volume carries through with the beginning years of the forerunners of Royal Dutch and the early days in Indonesia, and runs through the year 1897.

Vol. 2 contains six chapters, 355 pages, commences with the Pennsylvanian oil growth in the United States and the early Rockefeller companies, and continues on to the early 1900's.

Vol. 3 contains four chapters, 307 pages, and runs from 1907 through 1914.

Vol. 4, 362 pages, contains two very long chapters and a very complete index, and goes from World War I to our last decade.

All four volumes are replete with illustrations, charts, and maps. Accounts of technical growths of the different divisions of the industry are woven throughout. These volumes are particularly valuable in that they give accounts of oil's growth in the Far East, in Russia, in Romania, in Venezuela, and many other countries.

APPLIED MATHEMATICS IN CHEMICAL ENGINEERING, by Harold S. Mickley, Thomas K. Sherwood, and Charles E. Reed. Second edition. Published by McGraw-Hill Book Co., 330 West Forty-second Street, New York 36, N. Y. 413 pp. $9.

This book has been written to consolidate the methods of applied mathematics that appear most helpful to the chemical engineer into a form that can be used readily by both the student and the engineer. Considerable attention is given to the problem of expressing a physical situation in mathematical language. Problems drawn from engineering literature and practice are used to illustrate the mathematical procedures.

The book takes the man with a limited mathematical background by step-by-step procedure from sample situations through applications of higher advanced techniques of complete physical analysis.

Much new material has been included in this second edition. Some of the changes are: amplification of the treatment of diffusion and mass transfer between phases, new material of turbulence and eddy diffusion, data on mass transfer collected and correlated, and additional material on countercurrent equipment and operations.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Laboratory Testing

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—107

Methods of Finished-Product Testing

CONTINUING with a brief explanation of specific tests used for finished products:

8. Diesel index . . . This is a value that indicates roughly the aromatic content in a sample of diesel fuel. Aromatics do not perform good in diesel engines. Therefore the diesel index is a good indication how good a diesel fuel is. Diesel index is one-hundredth of the A.P.I. gravity of the oil multiplied by the aniline point of the oil. The higher the diesel index the better the oil will perform in a diesel engine.

9. Doctor test . . . Like the copper number test, the doctor test indicates the presence of mercaptans, the foul smelling and corrosive sulfur compounds. The doctor test is a quick method and will show very small amounts of this undesirable material, therefore it is used as a control test in naphtha treating.

The doctor test consists of shaking doctor solution (sodium plumbite made of lead oxide and caustic) and a pinch of sulfur with the sample being tested. The sample is sour and does not pass if a change of appearance in color takes place. This change may be yellow, brown, or black, depending upon the extent of the presence of mercaptans in the sample.

10. Ductility . . . This is a measure of the ability of road-oil type of material to be drawn out into a string without breaking. This property in the oil keeps roads and roofs sealed and the seal does not crack open.

This test is applied to semisolid residuum type of oils. The test consists of pulling a sample in a controlled-temperature bath. The sample will draw out into a fine thread. The distance the ends are apart at the breaks is called the ductility. The test is recorded in centimeters.

11. Emulsion test . . . A measure of the ability of an oil to separate from water is called the emulsion test. This is very important in the lubrication of equipment where both water and oil are present, such as in turbines, steam end of pumps, etc.

This test consists of blowing dry steam through a sample of oil until the condensed steam and oil together are a certain volume. The steam emulsion number is the time in seconds required for the water and oil to completely separate.

12. Explosivity test . . . This is an indication of the amount of light oil remaining in a fuel. The light material could be a fire hazard and this test measures this possibility.

Explosivity tests are run on residual fuel oils. A sample of fuel oil to be tested is heated to 125° F. The vapors formed are run through a gas tester to detect the hydrocarbon vapors present. If the tester indicates explosive, the results are recorded as 100 per cent. If only a part of the distance between 0 and explosive is indicated by the pointer, this travel of the pointer is expressed as percentage of explosivity.

13. Gas analysis . . . The Podbielniak, commonly shortened to Pod, low-temperature distillation method of separating gases is very satisfactory when the hydrocarbon boiling points are far enough apart to permit a separation. The gases are identified by the temperatures at which they boil. The amount of each kind of gas in the sample is measured by collecting each gas separately as it is distilled.

The mass-spectrometer gas analyzer can be described as an electrical method for analyzing gases. A gas is broken into small parts by electricity and then sorted out, amplified, and recorded electrically. From the recorded information, a trained mass-spectrometer operator can identify the gases in a sample and can determine how much of each kind of gas is present.

All hydrocarbons absorb light to some extent when it is passed through the sample. Some absorb more in the shorter wave lengths known as ultraviolet light, while others absorb strongly the light in the longer wave lengths known as infrared light. Since each hydrocarbon has its own light absorption characteristics, much as each person has his own fingerprint, this property can be used to identify and measure the amount of a specific hydrocarbon present. The infrared and ultraviolet gas analysis instrument is used for this purpose.

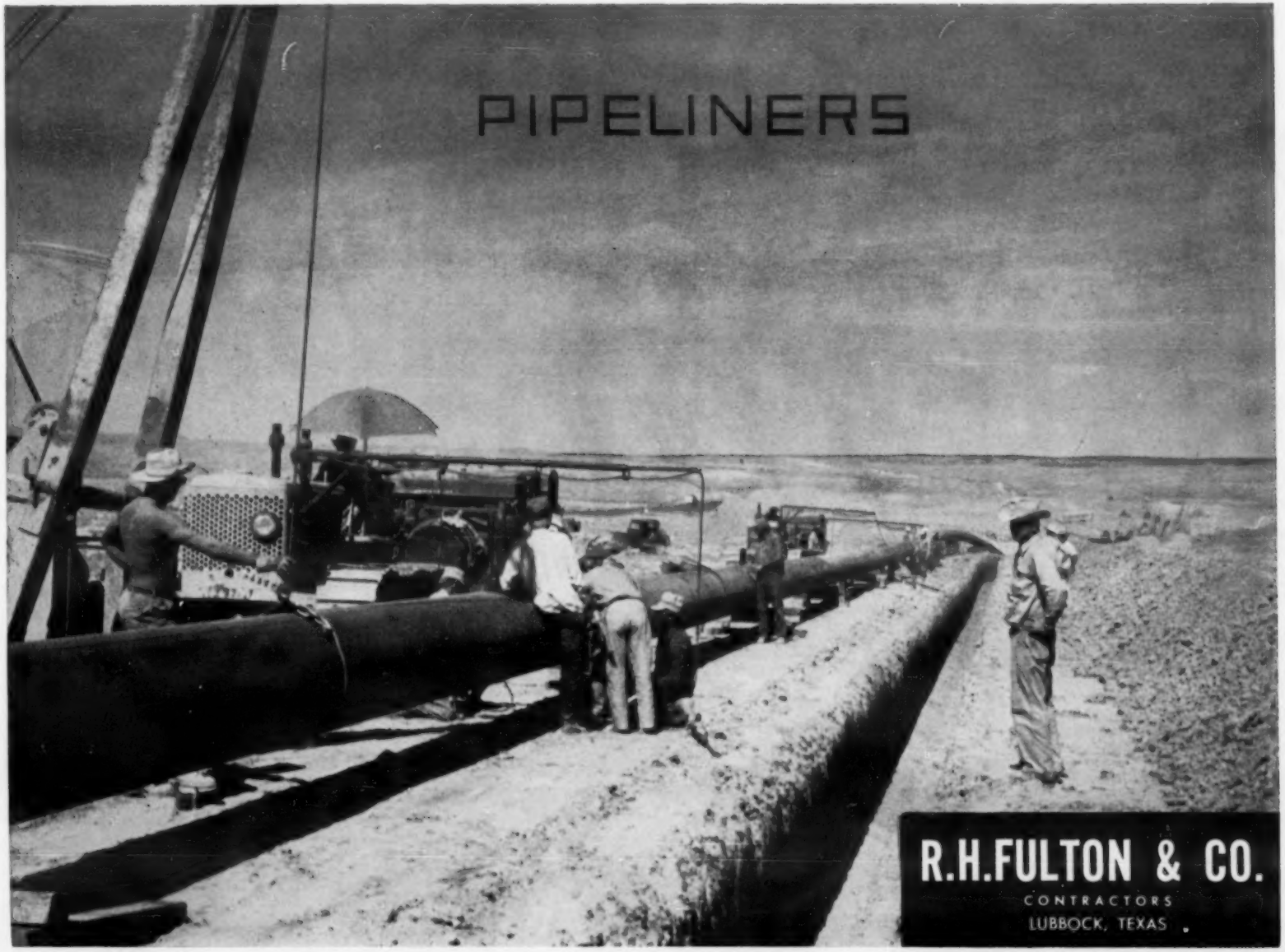
The oldest and still very dependable method of identifying gases is by chemical analysis. In making a complete analysis of any gas sample with more than just a few gases present, two or more of the available methods of analysis are normally used.

The Orsat gas-analysis apparatus is commonly used for selectively removing carbon dioxide, oxygen, and unsaturated hydrocarbons (olefins, diolefins, etc.) from a mixture of gases. The removal of each gas is complete; therefore, the amount of each gas in the mixture can be measured.

14. Gum test . . . Gum in finished gasoline is an undesirable quality because excessive amounts will cause valve sticking and carburetor fouling in engines.

The gum content of gasoline at the time of testing is determined by evaporating a sample of gasoline with heat and air until only the gum remains in a glass container. The gum is reported as the weight of gum in a measured volume of gasoline.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.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Here are horrible examples of cooling-system neglect.

Part 1 of a series on how . . .

Cooling-system maintenance pays off

By Dan Haack
Mid-Continent Pipe Line Co.

NO single phase of engine maintenance will return greater dividends in efficient, low-cost engine operation than a good maintenance program for the cooling system and the air breathing system. This is borne out by the Society of Automotive Engineers when they state: "The regulation of engine operating temperatures by the cooling system is indispensable for dependable performance, maximum power, and economy of operation. None of these is possible without a properly functioning cooling system." This statement can be broadened to include the air-supply system as well.

The need for training employes in good maintenance is noticeable. For example, the manager of a large oil-field engine-repair shop recently told me, "You should see the rust, scale, mud—yes, even crayfish shells which we are obliged to remove from the water jackets of our customers' engines." He further expressed amazement that Mid-Continent Pipe Line Co. is able to use cylinder liners almost indefinitely without experiencing corrosion and pitting of the outer walls. He stated that sleeve replacement due to external corrosion was a frequent occurrence in his customers' engines.

Many of the troubles actually caused by cooling-system and air-filter neglect are blamed on other components of the engine. This is true because much of this trouble is of the creeping type which starts long before we are confronted with the violent symptoms of the final stages. For example, we know that a carelessly maintained cooling system will soon accumulate rust and scale. This is followed by sharp variations in temperature between the head and block which may never show on the temperature gage. Uneven temperatures cause uneven rates of expansion which in turn cause cracking or warping. Even slight distortion can be the small beginning of general motor breakdown such as cylinder wall and ring wear, valve failure, etc.

Troubles traceable to the cooling system are one of the greatest single causes of motor deterioration and eventual breakdown. Since the final effects of cooling-system or breathing-system neglect are often so long delayed, the causes may be long forgotten by the time the actual breakdown takes place. Early or late, however, the result is always the same. The point will finally be reached where the equipment will have to be shut down to make difficult, expensive repairs and install costly replacement parts.

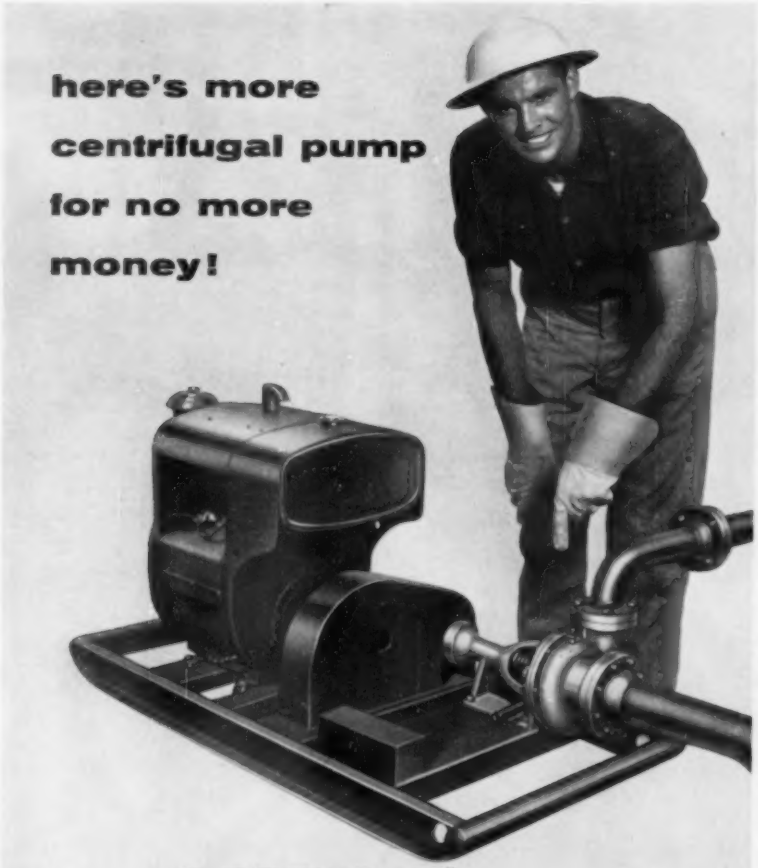
We will be primarily concerned here with the maintenance of conventional liquid-cooled systems. Air cooling, vapor-phase cooling, and other special applications will only be briefly mentioned.

Cooling Systems—General

Briefly reviewing the basic function of the engine-cooling systems, one-third of the heat produced by an internal-combustion engine is used for power. The remaining two-thirds is waste heat and must be removed to prevent destruction of the engine. Of this last portion, approximately one-third is dissipated to the exhaust, and the other one-third to the cooling system. An average oil-field gas engine must rid itself of 70 B.t.u. per brake horsepower per minute, and the cooling system must be able to dissipate this heat continuously.

Diesel engines dissipate only 40 to 50 B.t.u. per horsepower-hour. Therefore a radiator for a diesel engine need only be about two-thirds the size of a gas-engine radiator, provided they are both operated at the same water temperature. The three main types of engine cooling are air cooling, conventional liquid cooling, and ebullition or vapor-phase cooling.

Air-cooled engines . . . In this system, the heat is drawn off by moving air



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into direct contact with the engine. Air cooling systems require a blower which channels the air at high velocity through tunnels, shrouds, and baffles. The greatest amount of air is directed to the hottest parts of the engine where cooling is most needed. A common error is for inexperienced operators to remove part of the shrouding from the cylinder heads or other parts in the mistaken belief cooling would be improved. Of course the reverse is true.

This is comparable to stopping the circulation of water in a liquid-cooled engine, and can result in serious damage. The heat escapes from the engine through the fins which increase the area of the metal surface exposed to the air. Care should be taken to prevent breaking off any of these fins during overhaul, and they should be kept free from dirt, lint, weeds, or other obstructions to the free flow of air.

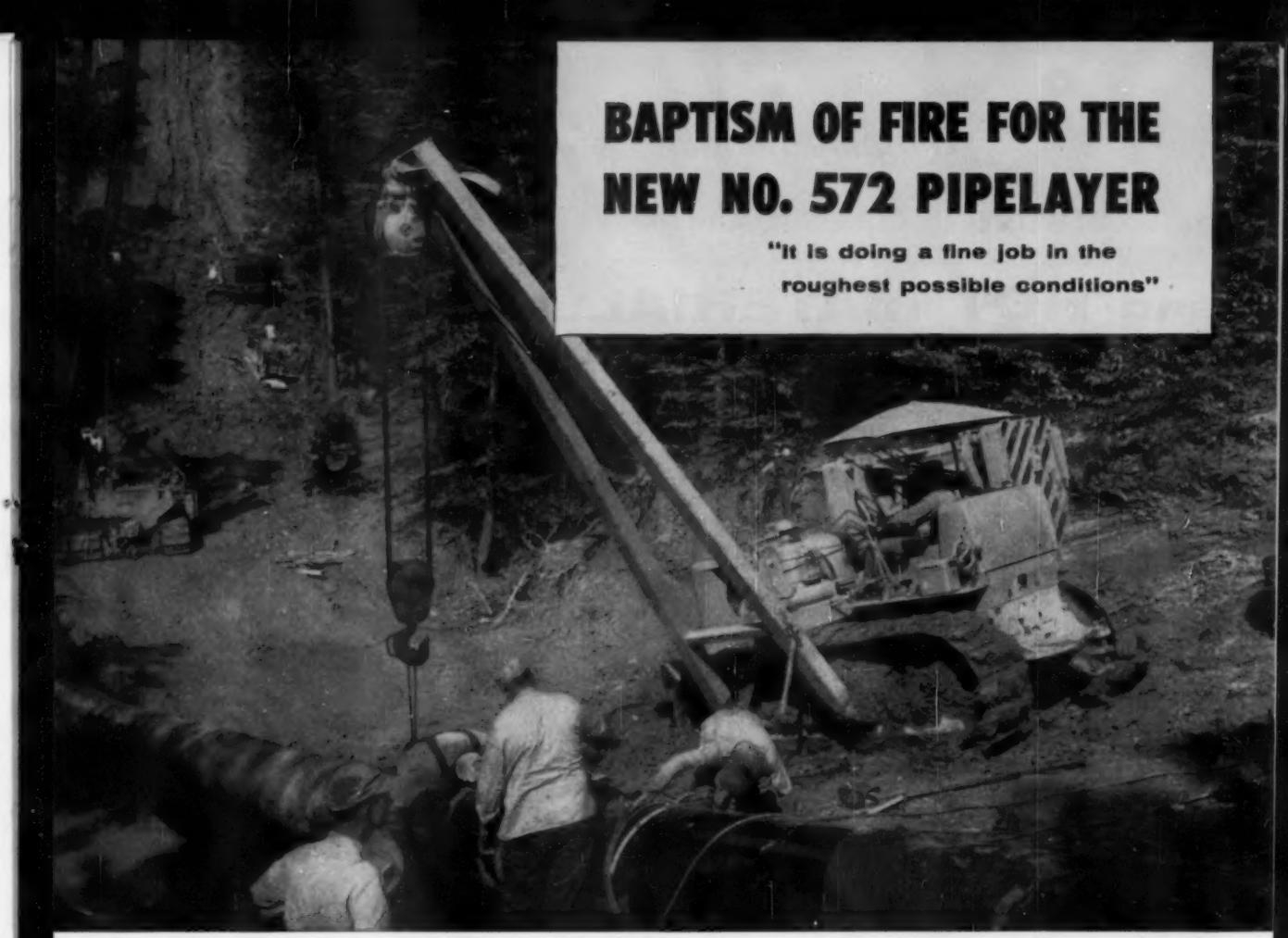
Generally speaking, the minimum operating speeds of air-cooled engines are higher than comparable water-cooled engines, because at exceptionally low speeds many air-cooled types do not generate enough air to cool themselves properly.

Conventional liquid cooling . . . This is the most common type of cooling system, and the one about which we are chiefly concerned. In this system, the coolant is circulated by a pump through hollow passages surrounding the hottest parts of the engine. After leaving the engine the water passes into a radiator or heat exchanger where the cooling medium can extract the heat.

The use of heat exchangers instead of radiators is very popular in oilfield and pipeline operations. Shell-and-tube type of exchangers are standard with our company, and we find that they have a number of advantages over radiators. They are not subject to the vibration troubles commonly experienced with radiators, and they can be located remote from the engine, thereby improving maintenance accessibility. We also gain a double advantage by cooling our engines with the crude oil flowing through our stations.

The more the engines are cooled, the more the crude oil is heated. This makes the oil easier to pump, and we save on fuel costs as a result of reduced power requirements. Some saving is also effected by eliminating the power-consuming air fans needed for radiators.

Ebullition, or vapor-phase cooling . . . In this type of system, the water is



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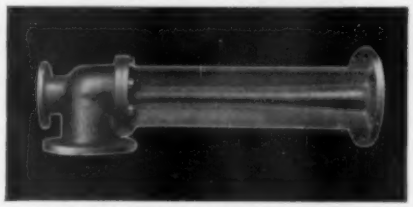

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permitted to boil in the engine water jackets and the circulating pump is eliminated. The boiling water absorbs the heat from hot metal surfaces by partial evaporation without much change in temperature. (The water temperature is actually controlled by the pressure kept on the system.) In the conventional water-cooled system, 1 B.t.u. changes the temperature of 1 lb. of water 1° F.

The vapor-phase method is based on the principle that 970 B.t.u.'s are absorbed in changing 1 lb. of water to steam, without a corresponding rise in coolant temperature. Whereas a conventional liquid-cooled engine operates at 160° to 170° F. water-jacket temperatures, the vapor-phase system operates at 212° to 250° F. These comparatively high temperatures are said to have a number of advantages, particularly reducing wear in engines burning high-sulfur-content fuels. Less bulky circulation equipment is needed, due to improved heat-transfer rates, and a high percentage of waste-heat recovery is possible. The reclaimed heat can be transformed into useful steam pressure up to 25 psi. for heating, air conditioning, treating crude oil, etc.

On the debit side, some users have experienced cylinder-wall-lubrication problems which required considerable experimentation and modification before satisfactory operation was achieved. We ourselves have not converted any engines to the vapor-phase system. However, such companies as United Gas Pipeline Co., Tidewater Associated Oil Co., Pan American Petroleum Corp., Gulf, Socony, Humble, Sinclair, and others have the method under test. It appears certain that this type of cooling will be developed more.

Preventive Maintenance—General

The coolant is as important in the operation of an engine as the fuel or lube oil. At no time can the transfer of waste heat from the inside of the engine to the cooling system be slowed or interrupted without serious consequences. It is absolutely necessary to keep the formation of scale, rust, and other deposits to a minimum. This is true because the heat-transfer resistance through scale and fouling is independent of fluid velocities, and is a function of the heat-conductivity characteristic of the deposit itself.

Good cooling water must be soft enough to prevent the deposit of scale, and must be free from foreign matter in suspension. Water which may be suitable for human consumption may be too hard for cooling-system use.

Coolants containing more than 500 p.p.m. of calcium or magnesium salts will cause scale formation.

Preventing Rust and Corrosion

Perhaps the most serious drawback to water as a coolant is that it has a natural corrosive action on metals. This chemical action, which is a form of corrosion, causes rust. Over 90 per cent of the solid matter that clogs radiators is rust. The rate of such rust formation depends upon a number of factors such as temperature, impurities in the water, corrosive contamination, and air in solution. Rain water, or distilled water which is the very best to use to prevent scale, is more likely to cause rust than most natural waters.

The so-called noncorrosive metals such as copper and brass are also subject to direct corrosive attack of both the electrolysis chemical types. Probably you have seen radiators that have suddenly developed pin-hole leaks and just seemed to come apart at the seams. Chances are, you charged it up to vibration. But the odds are that it was corrosion. Even thick pieces of metal such as cylinder liner walls become severely pitted (and eventually useless) under corrosive attack.

Results with inhibitors . . . The answer to the rust and corrosion problem lies entirely in the use of a good corrosion inhibitor. Most people are familiar with the use of rust inhibitors in antifreeze during the winter, but do not follow up with an inhibitor during the rest of the year. This is a serious mistake, because a good corrosion inhibitor reduces the normal rusting of iron by at least 95 per cent and can extend the useful life of antifreeze indefinitely.

The inhibitor we have selected for year-around use in all of our engines is sodium chromate—Na_2CrO_4.

Chromates provide protection by forming a microscopically thin film on the metal surfaces. Due to this minute thickness, heat-transfer rates are not affected to any extent. The treatment renders the metal passive to attack by depressing its solution potential. (Sodium chromate is not to be confused with sodium bi-chromate which requires the addition of caustic soda to attain the desired pH values.) We mix sodium chromate with water in the ratio of approximately 7 lb. per 1,000 gal. This works out to be about 2 oz. per 4 to 6 gal. The expense of such a program is negligible, as the additive is commercially available at about 23 cents per pound.

Sodium chromate chemically decomposes with time and use, and it is

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necessary to add about one-half the initial dosage every 6 months to maintain the desired concentration. The rate of decomposition is speeded up in antifreeze solutions, and it is necessary to add the inhibitor more frequently. Since starting to use chromate about 1949, we have never encountered any serious corrosion problems in any of our engines. We know of no single instance where corrosion has taken place when the required concentration of chromate is maintained. This means holding pH values between 8.5 to 9.5 and chromate at 1,000 p.p.m. A solution of this strength is indicated by a strong yellow color just bordering on orange.

Combating acid . . . The use of sodium chromate in ethylene-glycol antifreeze solutions is also of interest. Du Pont's antifreeze laboratory in Wilmington, Del., has developed an antifreeze analyzer to determine whether or not a used batch of antifreeze is safe to use over again. According to these experts, permanent type of antifreeze can turn acid in the cooling system after one season's use. Air and exhaust gases seeping into the system break down the glycol, forming harmful acids. When the original inhibitor becomes depleted, severe corrosion sets in, which is why most antifreezes are not recommended to be used more than one season.

However, when sodium chromate is added to an antifreeze solution, a chemical reaction takes place which begins to decompose the chromate in such a way as to liberate alkali. The amount of alkali formed is more than sufficient to neutralize any organic acids which may be simultaneously produced in the glycol. There is no harmful result in this reaction other than that the chromate is used up. If we continualiy add fresh chromate to an antifreeze solution, it is clear that Du Pont's analyzer will continue to show a safe reading. We ourselves have used ethylene-glycol solutions continuously for 4 and 5 years under such conditions without ill effects. No harm results from adding too much chromate—it only means you can run longer before putting more in.

Another problem which we have overcome by using sodium chromate is the presence of air in the cooling system. Air can often get into the coolant by leaks around the water-pump stuffing boxes, etc. According to the S.A.E., aeration can increase corrosion of iron as much as 30 times.

By simply adding sodium chromate to the water, however, we can solve the aeration problem at one stroke. Aeration has practically no effect when the required 1,000 p.p.m. of chromate is in solution. We regard the proper use of sodium chromate as being the most valuable and important single factor in cooling-system preventive maintenance. It should be borne in mind, however, that this corrosion inhibitor is not a cleaner for rust already formed. Any necessary rust removal should be performed before installing the chromate.

Article adapted from paper presented at Stationary Industrial Engines Short Course, University of Oklahoma, Norman, May 7-8, 1957.

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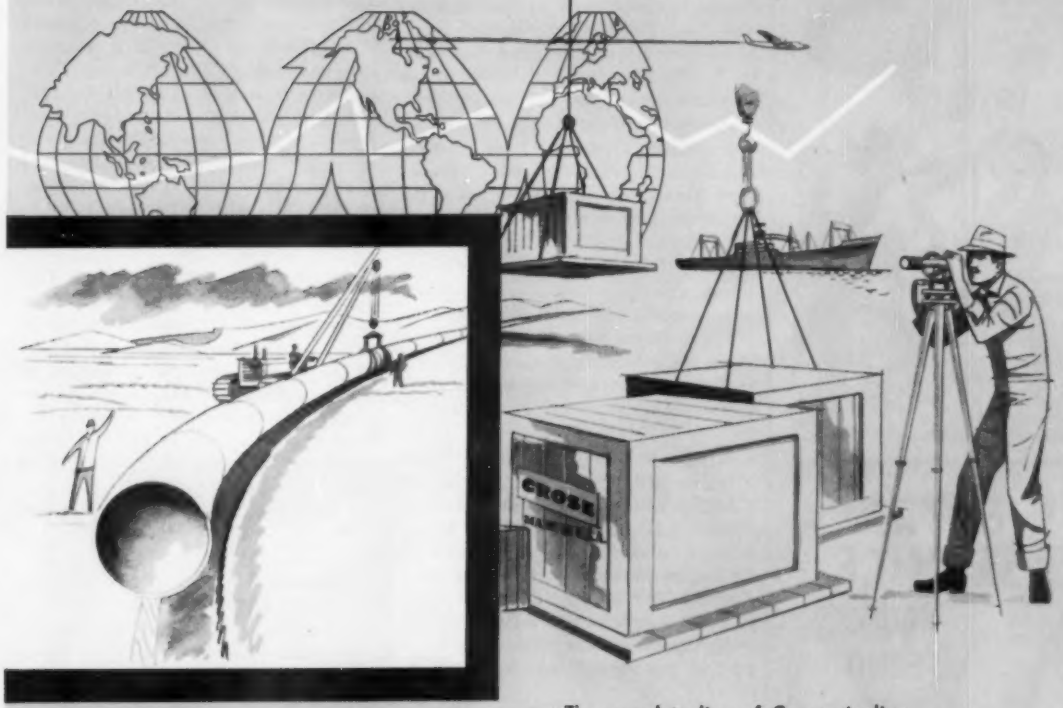

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Among the Drilling Contractors

Loffland Appoints Poe to West Texas Contract Post

R. W. Wire, president of Loffland Brothers Co., Tulsa, announces the appointment of J. D. Poe as contract representative of the West Texas-New Mexico division, with offices in Midland, Tex. Poe has just returned from an extended vacation, and succeeds H. J. Shumate who is being transferred to New York City as manager of foreign contracting.

Previously, Poe has been division superintendent of the West Texas-New Mexico division for 9 years. He began his employment with Loffland in September 1929.

R. H. Tipton, recently appointed acting superintendent of the division, now becomes superintendent in charge of all drilling operations in the West Texas-New Mexico division.

Poe will continue his residence in Odessa, Tex.

B. G. Byars Drilling Co., Tyler, Tex., is getting well under way on a Paluxy wildcat 4 miles northwest of Tyler, in Smith County, East Texas. It is a contract job for Lyons & Lyons, of Shreveport. Location, at 1 Frazier, in the John Lane Survey, is about a mile southwest of its Lake field, nearest Paluxy production. Prospective pay is expected by 7,800 ft.

Ace Drilling Co., Dallas, has the contract on Thomas D. Humphrey & Sons' new Woodbine test 2 miles south of Slocum, in Anderson County, East Texas. The test, 15 Bishop, in the W. R. Wilson Survey, is slightly less than ¾ miles southeast of David Gail field, where there is oil production from the sub-Clarksville zone, and about the same distance northeast of Agnes field, productive from the Woodbine. Drilling permit for the new test is for 6,500 ft.

Bush Drilling Co., Eunice, La., is keeping a rig busy in the new oil area opened early in October between the Southwest Bunch Creek and Northeast Reeves fields, in southwestern Allen Parish, South Louisiana. Bush drilled Thomas Jordan's discovery well, productive from a 6,200-ft. sand, and now is completing hole on Jordan's second well, about 990 ft. south of the discovery. From this well, Bush's rig will go to Jordan's third location, 1,320 ft. farther south. Holes are being drilled to about 7,500 ft.

Barnwell Drilling Co. has two new Travis Peak jobs in the Blocker area, in Harrison County, East Texas, where it is drilling for Barnwell Production Co., with which it is affiliated. Drilling already is well along on the first test, 1 Blocker-Fultz, in the John Maxmillian Survey. Location for the other is at 1 Lindset, in the Pennington Lindsey Survey. It is about 5½ miles south of Marshall. They are 7,000-ft. tests.

Marshall R. Young Drilling Co., Brookhaven, Miss., has contracted for a deep Lower Cretaceous test to be drilled for Arkansas Fuel Oil Corp. at a wildcat location southeast of Soso, in Jones County, South Mississippi. Its location, at 1 Rasberry Estate, in 21-9n-13w, is about 3 miles southeast of Gulf Oil Corp.'s Paluxy discovery well at Gitano. It is scheduled to go to 12,000 ft., which should take it through the Rodessa zone.

Johnson Drilling Co. has contracts for two additional wildcat tests Hunt Oil Co. has projected for the Dialville area, Cherokee County, East Texas. Hunt's permit in each case is for a 5,500-ft. Woodbine test. Location of one, at 1 Musselwhite, in the G. M. Harlow Survey, is about 2 miles northeast of Dailville. The other is on Hunt's Roach lease, in the Beverly Pool Survey, about a mile closer town.

Markham Drilling Co., Casper, has contracted for a 5,300-ft. Tensleep test to be drilled for G. L. Reasor at a wildcat location southeast of the old North Casper Creek field, about 20 miles northwest of Casper, in Natrona County, Wyoming. Reasor's location is at 1 Chambers, in 9-36n-81w.

Ike Taylor is contractor on a 2,700-ft. test Continental Oil Co. is starting 8½ miles southeast of Telgen, in Petroleum County, Montana. Location is at 1 Olsen-Federal Land Bank, in 3-13n-25e. Taylor has a string of tools working for his own account

in shallow drilling in Brush Creek field, about 20 miles northeast in the same county.

Oil Production Maintenance Corp., Houston, is getting started on a new 7,000-ft. test it has contracted to drill for Oil Reserves Corp. in southeastern Polk County, southeastern Texas. Its location is about a mile southwest of West Segno field, productive from a 5,400-ft. Cockfield sand. Objective in the new test is the deeper Yegua formation. Location is listed as 1-K Kirby-Stephenson, in the James Stephenson Survey. It is less than ¼ mile north of the Hardin County line.

Crow Drilling & Producing Co., Shreveport, has the contract for a Wilcox test Durbin Bond & Co., Inc., of Little Rock, Ark., is undertaking at a wildcat location, 1-B Tensas Delta, in 10-8n-5e, about 2 miles southeast of Manifest, in Catahoula Parish, eastern Louisiana. Proposed drilling depth is 5,000 ft.

Oil Corp., Corpus Christi, has moved its rig from the 6,620-ft. wildcat it has drilled for Coloma Oil & Gas Corp. northeast of Gregory, in San Patricio County, lower Texas Gulf Coast, to a location 2,000 ft. northwest, where it is starting another test for the same operator. The new test, 1 Richardson, has a permit for 7,500 ft. Locations are about 2 miles from town in Gregory Farm Block A, and northwest of Enos Cooper field.

Montgomery Drilling Co., El Dorado, Ark., has taken on a 4,400-ft. drilling job for Murphy Corp. and Sun Oil Co. in Franklin Parish, northeastern Louisiana. It is a Lower Cretaceous test about 2½ miles southeast of Mangham at 1 Eley, in 15-15n-7e. Nearest production is in West Baskinton field, a little more than 3 miles northeast.

Stewart & Gouger Drilling Co., San Antonio, has a rig working for Arkansas Fuel Oil Corp. on a deep test in Corpus Christi Bay just off shore from Harbor Island. It is a 9,500-ft. wildcat test. Location is in State Tract 316. It is about 5 miles southeast of Aransas Pass.

John B. Stephens is contractor on a new 6,700-ft. test W. L. Pickens and associates, of Dallas, are putting down in southeastern Rains County, East Texas. Its location, at 1 Gilley, in the Isaac Kneeland Survey, is about 3 miles southwest of Alba.

Maxwell Herring Drilling Co., Kilgore, Tex., has a new relatively shallow job going about 4 miles east of Quinlan, in southern Hunt County, East Texas. It is a 3,500-ft. Woodbine test for B. G. Byars and R. L. Peveto, of Tyler, Tex., at 1 Griffis, in the Henderson Cozart Survey.

Hondo Drilling Co., Midland, Tex., is on a new wildcat job in Scurry County, West Central Texas. It is a 7,600-ft. test for Clifford L. Brown, Jr., whose location, at 1 Davis, in Section 389, Block 97, H&TC Survey, is about 7 miles northeast of Snyder. **Empire Drilling Co.,** Dallas, is the contractor on another new wildcat operation about 3 miles farther northeast of Snyder, in the same county. It is drilling for Chambers & Kennedy at 1 Johnson, in Section 238, Block 2.

Aldridge & Stroud, Inc., Odessa, Tex., is drilling for M. H. McKinney and J. A. Leonard at a wildcat location 16 miles north of Mentone, in southwestern Loving County, in far-western Texas. It is a 4,700-ft. test in Section 36, Block 54, T-1, T&P Survey. This is on the eastern rim of the Delaware basin.

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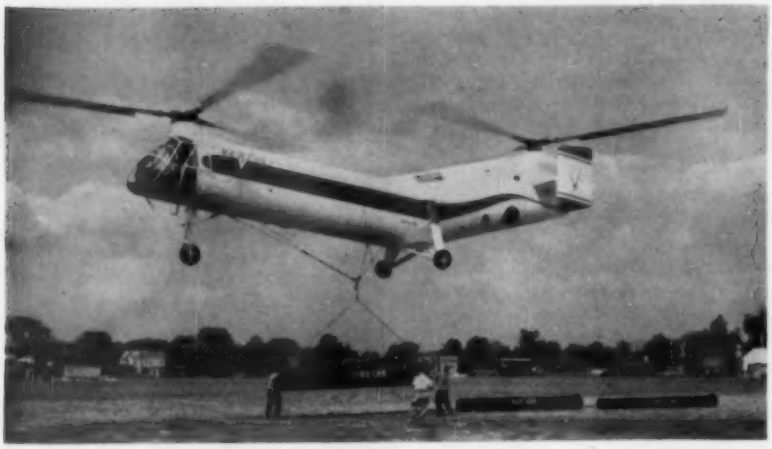


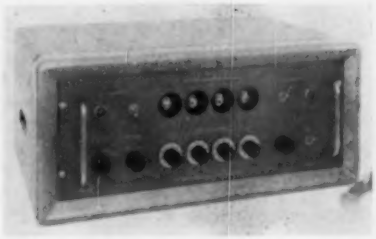
Helicopter Carries Gigantic Payload

This is said to be the world's largest commercial helicopter. It's expected to handle a variety of chores in offshore drilling and production as it can carry 19 passengers or more than two tons of cargo.

Cruising at a speed of 88 knots, the helicopter has a range of 315 miles with its standard fuel reserve. Its service ceiling is 10,600 ft., and its CAA-certified gross weight is 14,000 lb.

Called the Vertol Model 44, the helicopter has a 25 per cent higher payload over a 100 nautical-mile radius than earlier military models now in use, the maker reports.

The tandem-rotor design employed by the craft is said to offer an important advantage over a single-rotor design in that it gives a greater range for the center of gravity. The wide center-of-gravity range permits fast loading and unloading at terminal points without juggling cargo to achieve a stable flying condition. **Write or call: Vertol Aircraft Corp., Morton, Pa., for details on Model 44 helicopter.**



Digital Flow Indicator Gives Direct Readings

Shown here is a new digital flow indicator and totalizer which gives a direct reading in gallons per minute or hour. It can be adjusted to specific gravity changes to give readings in pounds per minute or per hour. And it will give direct readings of speed in revolutions per unit of time, the maker reports.

When used with two Pottermeters, the instrument will indicate the ratio between two flows. Model 43 samples the desired information for a controlled sample period. It is adjustable from 1/10 millisecond to 10 seconds in increments of 1/10 millisecond. **Write or call: Potter Aeronautical Corp., Route 22, Union, N. J., for details on Model 43 flow indicator.**

•

Chemical Gage Takes Pressures to 2,000 Psi.

Lightweight and compactness are valuable features cited for this new capsule chemical gage. It is designed to function without the use of gaskets or bolted joints.

The maker recommends it for those services requiring a short, compact

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of November 4, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

New Equipment

pressure-sensing element and for use under high-temperature conditions when properly calibrated at the operating temperature.

It is said to be especially applicable to petrochemical and processing plants for accurate and sensitive pressure control of such hot liquids as asphalt, coal tar, byproduct residue, and other viscous fluid.

Designated as No. 2594, the gage has a diaphragm fabricated from Type 316 stainless steel. But it can be obtained fashioned of any metal which can be formed and welded as a capsule.

The housing is furnished with either a Type 316 stainless-steel or malleable-iron body. The gage can be obtained with any of four standard dials with diameters of 3½, 4½, 6, and 8½ in. Accuracy is guaranteed to ± 1 per cent of full-dial range.

When the gage is subjected to high temperature, its maximum-pressure rating is 1,000 psi. When subjected to normal temperature, its maximum-pressure rating is 2,000 psi. **Write or call: American Chain & Cable Co., Inc., 929 Connecticut Avenue, Bridgeport 2, Conn., for details on No. 2594 chemical gage.**

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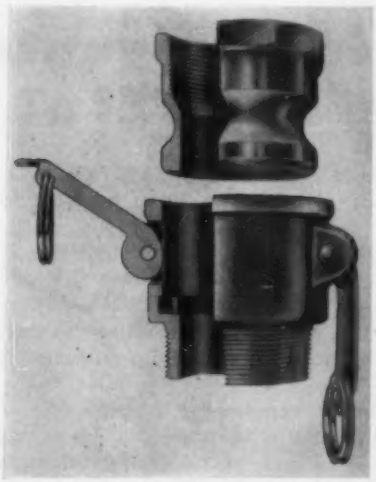


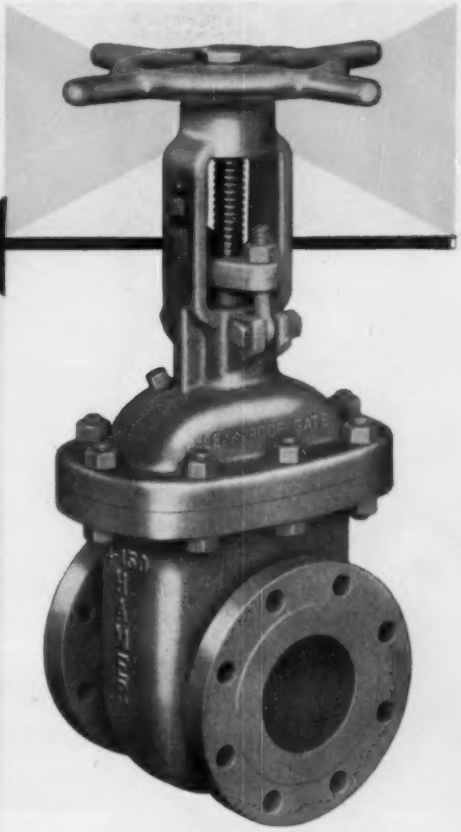
Quick Couplings Feature Provision for Seals

Featuring a slotted lever for the seals used in transporting aircraft gasoline or other special fluids, this new quick coupling comes in pipe sizes from 1¼ through 4 in.

Called Lever-Seal, the coupling is

Introducing the new

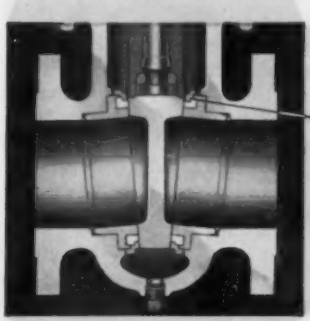
HAMER
Leakproof
GATE
VALVE



Impenetrable Shut-off Upstream —Downstream

This new Hamer Gate Valve incorporates a double sealing action design that's both absolute and foolproof. In addition to the precision metal to metal fit of the wedge, the Hamer Gate Valve incorporates two Teflon® seal rings which compress dead tight against the wedge. Thoroughly proven under the most rugged field condition tests, the Hamer Gate Valve with its positive shut-off both upstream and downstream, eliminates the need for a double block and bleed in piping installations.

Hamer Gate Valves incorporate a new high standard of valve production. Stainless steel valve seats are welded-in for accurate fit. Locking rings are of corrosion resistant stainless steel. And precision finish on critical parts assure a smooth operating valve even after years of hard service. Write today for literature. See for yourself why Hamer Gate Valves are truly **a valve without equal.**



Double Sealing Action forms Impassable Shut-off

TEFLON SEAL RINGS... Renown for their inert characteristics, these Teflon seal rings have amazing durability even under the most adverse of service conditions.

PRECISION FINISHED GUIDES... Wedge guides are machined to exacting tolerances. Eliminates chatter and wear caused by line pulsations, accurately centralizes the wedge between the seats.

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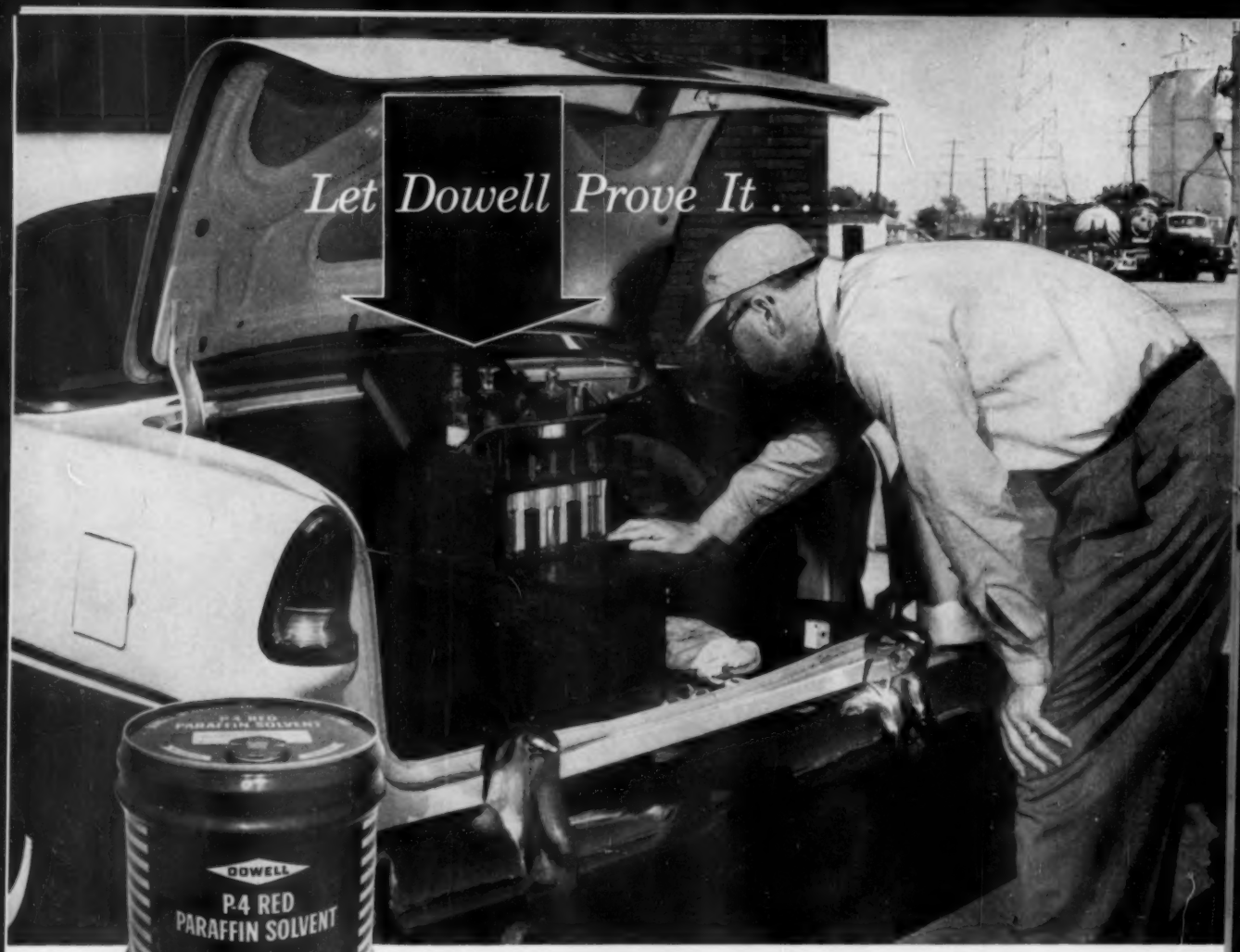

Dowell paraffin solvents are MORE EFFECTIVE!

Using samples of the paraffin from your well, Dowell engineers can show you with their portable solvent-testing kit how much more effective Dowell's Paraffin Solvents are. The kit also shows which Dowell solvent is the right one to use for maximum paraffin-removal.

The success of paraffin-removal treatments depends as much on the study of the problem and method of treatment as on the solvent chosen. Dowell recommends a careful study of the well, line or tank in order to determine the amount, condition and character of the paraffin deposit.

To complete the picture, each solvent offered by Dowell will effectively solve the problem for which it is designed. Each has exceptional dissolving properties, allowing it to penetrate even the toughest paraffin.

Various methods of applying Dowell Paraffin Solvents are described in a handy booklet, "Proven Methods For The Chemical Removal of Paraffin Deposits." It is available from any Dowell engineer.

When paraffin becomes your problem, call Dowell. Dowell Paraffin Solvents are available at many oil field supply stores and the 165 Dowell offices and stations in the U. S. and Canada. In Venezuela contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

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New Equipment

cast in a selection of high-quality materials by the automatic shell-molding process, the maker reports. All parts are interchangeable with those of major manufacturers. **Write or call: Central Machine & Tool Co., P. O. Box 861, Enid, Okla., for details on Lever-Seal couplings.**

●

Blowproof Manometer Keeps Fluid Intact

Here's a new manometer - column gage. The maker reports it effectively traps the indicating fluid within the column. It is equipped with a blowproof valve that eliminates the possibility of blowing mercury or other liquids out of the manometer tube.

Called Levelux, the manometer is said to be suitable for use as a liquid-level indicator or a differential - pressure gage. It's also useful for indicating flow of liquids or gases through pipelines.

The blowproof valve is built into the gage. It instantaneously locks closed whenever the indicating fluid moves up in the column beyond its normal operating range. The valve does not weep or allow the slightest amount of indicating fluid or mercury to squeeze past, even when it is overranged 10 times its normal operating range, the maker claims. **Write or call: Liquidivision Gauge & Control Corp., P. O. Box 51, Oceanside, L. I., N. Y., for details on Levelux.**

●

Inert Gas Generator Offers Many Capacities

Inert gas can be obtained readily for use in refineries, petrochemical plants, and others with this new Thermal Sub-X inert gas generator, the maker reports. The device utilizes direct-contact cooling of the products of combustion from a thermal high-velocity burner.

A wide choice of models is available using either gas or oil as fuel. Multiple-burner units can be obtained to meet high-capacity demands. All units are complete packaged type of assemblies with all controls included. The standard models offer rated outputs of 2,000 to 35,000 standard cu. ft. per hour.

In operation, the generator exhausts hot products of combustion from a burner into a cooling tank below the water level. This gives intimate contact between the products and the coolant. The resulting cooled gases can be used directly as they come from the vessel. Or they can be compressed to a higher pressure and passed through a dryer. **Write or call: Thermal Research & Engineering Corp., Conshohocken, Pa., for Bulletin 114.**

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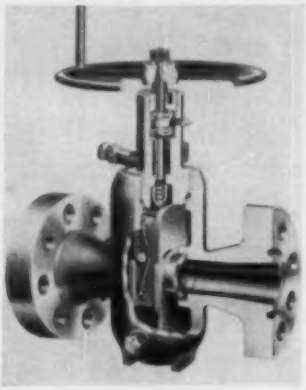

Reduced-Port Valve Rated at 5,000 Psi.

An A.P.I. working pressure of 5,000 psi. is offered by this new 2-in. reduced-port valve. It's specifically designed for use on christmas-tree-wing installations, the maker reports.

Its features include a pressure-seal bonnet, parallel expanding gates, two roller type of thrust bearings, a closed packing box, and superfinished stem. **Write or call: W-K-M Div., ACF Industries, Inc., P. O. Box 2117, Houston, Tex., for details on 2-in. reduced-port valve.**

●

Moisture Monitor Gives Water Content

Continuous, accurate measurement, remote recording, and control of low moisture levels are possible with this new CEC Type 26-310 process moisture monitor, the maker reports. The instrument is said to be built to give trouble-free service under the rugged environmental conditions of process-plant locations.

It is suited for monitoring the moisture content of instrument air streams and natural-gas transmission lines, according to the maker. It may be used for recording moisture levels of feed streams in low-temperature distillation units and in polymerization units too. Other applications include monitoring

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Described in OIL AND GAS JOURNAL - Issue of November 4, 1957

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New Equipment

dehydrating towers in gasoline plants, monitoring the effectiveness of air dryers in process plants, and measuring water-vapor content of stored petroleum gas.

Accurate measurements down to less than 1 p.p.m. are reported to be possible. The analysis is accomplished by continuously and quantitatively absorbing and electrolyzing all water present in the sample stream entering the instrument. The electrolysis current is related directly by Faraday's law to the mass rate-of-flow of water into the instrument. This relation is used as the indication of water content. **Write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif., for details on Type 26-310 moisture monitor.**

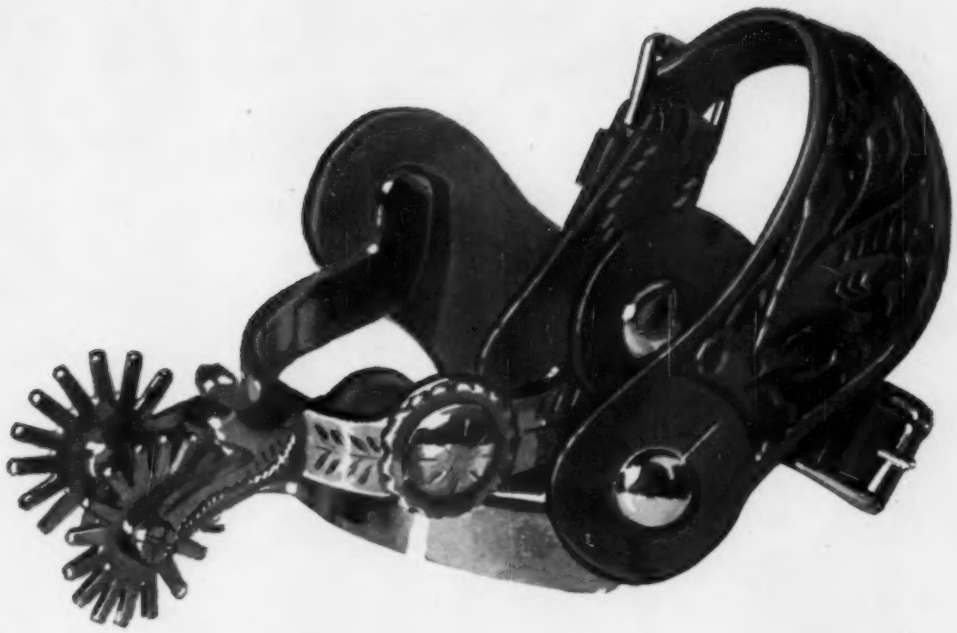
•

Oil Heater Heats to 600° F.

Here's a new direct-fired oil heater for heating transfer oils or other liquids to temperatures up to 600° F. Heat-transfer oils may be circulated through coils, molds, jacketed vessels, or other heat-exchange equipment to provide higher temperatures than can be economically obtained with high-pressure steam, the maker claims.

A forced internal-circulation design on the Industrial Peak-Temp oil heater is said to provide high-velocity flow of the heat-transfer oil over the heating surfaces. A simple fire-brick ring in the burner throat is the only refractory used.

Fired with oil, gas, or combination oil/gas, the heater is of the closed type. Employing a horizontal fire-tube design, the unit is a complete package with removable-heater element, integral



THE SUPPLY INDUSTRY HAS EARNED ITS SPURS

To serve the needs of a dynamic, migratory industry—such as the Petroleum Industry—requires on-the-spot service with inventories which are under constant adjustment to ever-changing techniques. The accomplishment of this task demands a tremendous investment, vast technical and logistical skills . . . **plus a dedicated personnel that is seldom found in any field of endeavor.**

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MACCO NORMALLY CLOSED CHECK VALVE

The Macco normally closed, positive, dual seating check valve represents one of the major developments in the evolution of gas lift equipment. It is a 10,000 p.s.i. test, 5,000 p.s.i. working pressure valve which is manufactured with ½" pipe thread connections for installation wherever a fine heavy-duty, dependable check valve is required. Their patented design makes them particularly resistant to the ill effects of abrasive erosion and acid.

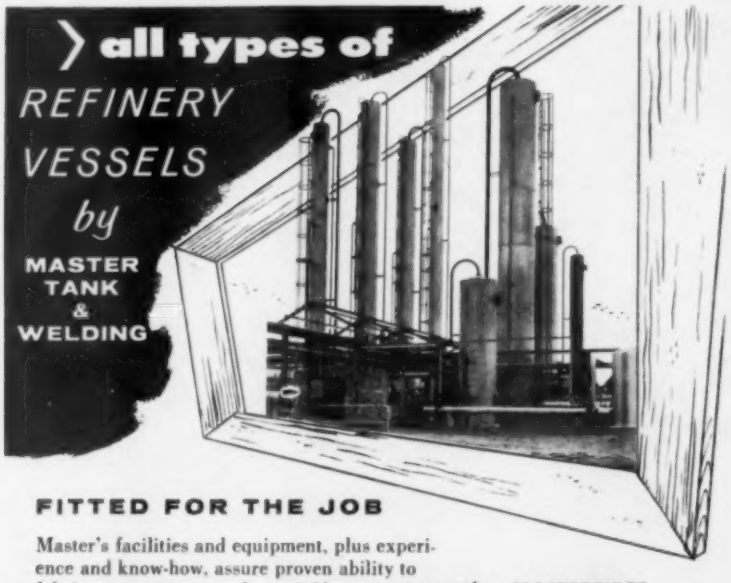
Installed on Macco gas lift valves this check valve positively prevents back flow of fluid from the tubing to the casing. They also make it possible to acidize the formation or back-pressure the tubing without exposing the casing to either acid or extreme pressures. A scientifically designed hollow "float" allows all of the gas or fluid which passes through the check valve to pass through the lateral openings and hollow stem. This feature provides protection for the spring. Macco check valves are dual seating—first, a metal shoulder on a "resinoid" disc and also metal-to-metal under high pressure.

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas

Phone UN 1-1253



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forced-draft fan and burner, and all necessary operating and safety controls. The heater element has a large vent at the top of the shell. The heater is used with an expansion tank and external-circulating set. **Write or call: Cleaver-Brooks Co., 326 East Keefe Avenue, Milwaukee 12, Wis., for details on Peak-Temp oil heater.**

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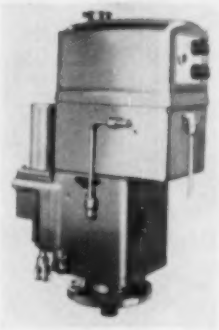

Engine Governor Allows Precise Speed Setting

Engine speeds can be set more accurately with the new setting mechanism now available on Woodward PG-PL governors, the company reports. The speed-setting mechanism was developed for applications requiring extreme precision.

It responds to a 0.001 psi. change in control-air pressure within the usual 3 to 15-psi range. It can also be operated in other pressure ranges. Such accessories as pneumatic or electric-shut-down devices are available.

Governors equipped with the mechanism can be easily adjusted in the field for any desired air pressure vs. speed relation or for reverse-speed setting, the maker says. They can be adjusted for extra-low standby idle speed, for normal minimum speed, or to shut down an engine or turbine by direct-speed setting.

The governor is suitable for use where speed control of a turbine or engine is required with pneumatic or electric speed setting. It can be used for maintaining constant pressure or suction; constant flow, liquid level, temperature, or other quantities which can be controlled by an air or electric controller to set governor speed.

Applications include air and gas compressors for catalytic cracking and other petroleum processes, refinery charge pumps, gas and liquid pipeline-pumping stations, and petrochemical plants. **Write or call: Woodward Governor Co., 5001 North Second Street, Rockford, Ill., for details on PG-PL governor.**

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New Literature

Packaged Remote-Control System for controlling or positioning valves and other final-control elements is the subject of new Bulletin 982. According to the bulletin the system can simultaneously regulate such process variables as pipeline pressure, flow rate, surge, liquid level, proportioning, and speed at distances up to many miles from one central location with one operator. The bulletin contains performance characteristics, diagrams, and other technical information. **Write or call: A. W. Cash Co., P. O. Box 551, Decatur, Ill., for Bulletin 982.**

●

Bronze and Iron Body Valves. Well illustrated 136-page hard-cover Catalog 57 covers (1) renewable-seat-ring bronze gate valves, (2) composition-disk bronze swing-check valves, and (3) solder-end globe valves with drain. It contains useful technical data for the initial design of piping layouts. The data includes: (1) table of equivalent resistance of valves, fittings, and bends, and (2) charts for the rational solution of pressure drop for liquids, gases, and steam. The use of these data permits rapid appraisal of pipe sizes required for the particular flow requirements. **Write or call: Fairbanks Co., Catalog Dept., 393 Lafayette Street, New York 3, N. Y., for Catalog 982.**

●

Pyrex Pipe for Drainlines in processing plants is pictured and described in new eight-page Bulletin PE-30. It lists over 100 troublesome chemicals that can be carried by glass lines. Along with installation data and representative glass fittings, the bulletin contains drawings, charts, and photographs. **Write or call: Corning Glass Works, Corning, N. Y., for Bulletin PE-30.**

●

Ball and Roller-Bearing Catalog and Engineering Manual. This new 88-page book includes an 18-page engineering-data section to correlate Anti-Friction Bearing Manufacturers Association (A.F.B.M.A.) terminology with Aetna designs. It explains how to select ball-thrust bearings, and how to calculate thrust-load capacities for any speed. It gives formulas for calculating thrust loads for various gear drives; oil and grease lubrication methods; a grease-selection guide; and tells how to handle and care for bearings. The catalog also gives complete specifications on ball-thrust bearings, washers, and retainers; mounted radial-bearing units; clutch-release bearings; and roller bearings. **Write or call Aetna Ball & Roller Bearing Co., 4600 Schubert Avenue, Chicago 30, Ill., for 88-page catalog and engineering manual.**

●

Closed-Circuit Television Camera, Model PD-500, is pictured and explained in this new four-page catalog sheet. It lists outstanding features and describes the design characteristics of the camera, its built-in power supply, and control accessories for remote operation. It also provides detailed specifications and dimensions. **Write or call: General Precision Laboratory Inc., 63 Bedford Road, Pleasantville, N. Y., for catalog sheet on closed-circuit television camera.**

●

Drilling Rig Power, a new eight-page booklet (Form D740), outlines the manner in which Caterpillar engines supply well-drilling power for both diesel-electric or mechanical rigs located on land or offshore. The booklet pictures typical installations and sets out the benefits to be gained by using engines equipped with torque converters. It tells how torque converters protect drilling engines from the rugged demands of

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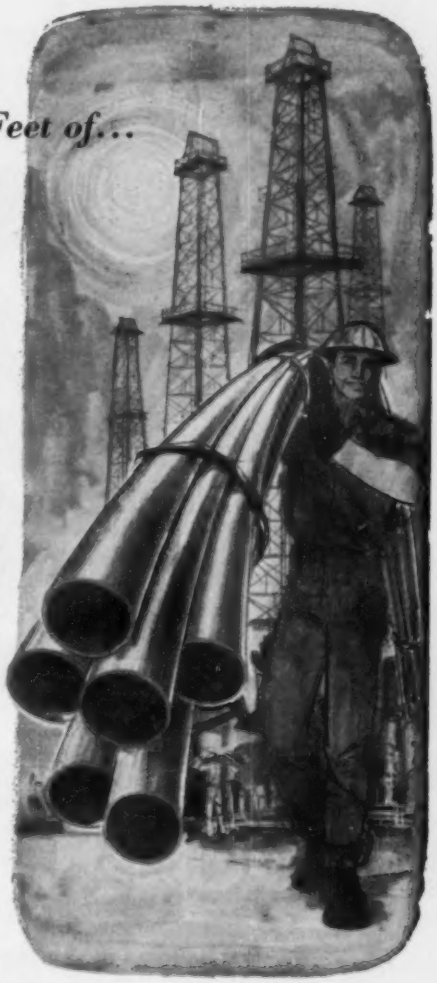

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drilling. The booklet also lists complete horsepower and kilowatt ratings for the company's engine line. **Write or call: Caterpillar Tractor Co., Peoria, Ill., for booklet "Universal Rig Power."**

●

Battery-Users Training Manual for lead-acid batteries covers every phase of battery maintenance, repair, and selection. This new 44-page reference manual (Bulletin GB-1599A) includes over 60 photographs, diagrams, and tables to review battery theory and construction, demonstrate proper battery selection, illustrate charging method and equipment, demonstrate battery testing and techniques, and to present correct battery-room layout. **Write or call: Gould-National Batteries, Inc., Trenton 7, N. J., for Bulletin GB-1599A.**

●

Lubricated Plug Valve Bulletin: This new 12-page illustrated lubricating manual describes the function of lubricants in plug valves and the essential properties of an effective lubricant. Using text and pictures, the manual gives detailed information on how to select the right lubricant and how to apply it. A two-page chart lists in alphabetical order more than 560 flow materials which lubricated valves service. Another chart presents the service range of each lubricant. The manual also contains concise guides for proper installation, adjustment, operation, and maintenance of lubricated plug valves. **Write or call: Walworth Co., Inc., 60 East 42nd Street, New York 17, N. Y., for plug-valve lubrication bulletin.**

●

Meters and Controls Bulletin G15-1 (eight pages) pictures and describes a line of instruments for transmitting, recording, indicating, and controlling differential pressure, flow, liquid level, temperature, pressure, draft, and vacuum. It furnishes applications and ranges and it supplies detailed literature references for the instruments. **Write or call: Bailey Meter Co., 1050 Ivanhoe Road, Cleveland 10, Ohio, for Bulletin G15-1.**

●

O-Ring Handbook. Consisting of 160 pages, this new 8½ by 11-in. handbook covers design and application of synthetic rubber O-ring seals. It explains those with numerous illustrations, tables, charts and other valuable data. Divided into nine sections, the book covers O-ring applications, and how to select them, gland design, installation, static and dynamic seals, and O-ring sizes. **Write or call: Rubber Products Div., Parker Appliance Co., 17325 Euclid Avenue, Cleveland 12, Ohio, for O-ring handbook.**

●

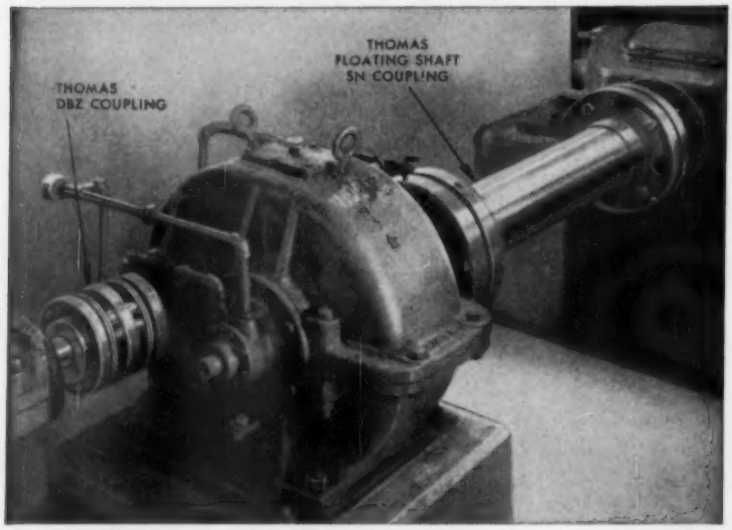
Heat Exchangers and Cooling Sections for petroleum processing are illustrated and described in new four-page Form HT-24. It gives their applications, advantages, design, and installation data. An interesting proposal for the approach to heat transfer and cooling in process plants is presented. The bulletin suggests that design engineers approach problems of heat transfer without limiting their thinking to specific kinds of equipment. **Write or call: Heat Transfer Div., National-U.S. Radiator Corp., 342 Madison Avenue, New York 17, N. Y., for Form HT-24.**

●

Aluminized Asbestos Safety Clothing for use in high-heat jobs is described and pictured in new Bulletin 1301-7, It reviews the protective properties of a new line of aluminized-asbestos safety clothing said to reflect over 90 per cent of all radiant heat. A keyed chart of laboratory-controlled test results compares the heat-resisting efficiency of the new clothing with that of other commonly used protective materials. **Write or call: Mine Safety Appliance Co., 201 North Braddock Avenue, Pittsburgh 8, Pa., for Bulletin 1301-7.**

THOMAS FLEXIBLE COUPLINGS

Give You Freedom From Coupling Maintenance



NO LUBRICATION **NO MAINTENANCE** **NO WEARING PARTS**

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

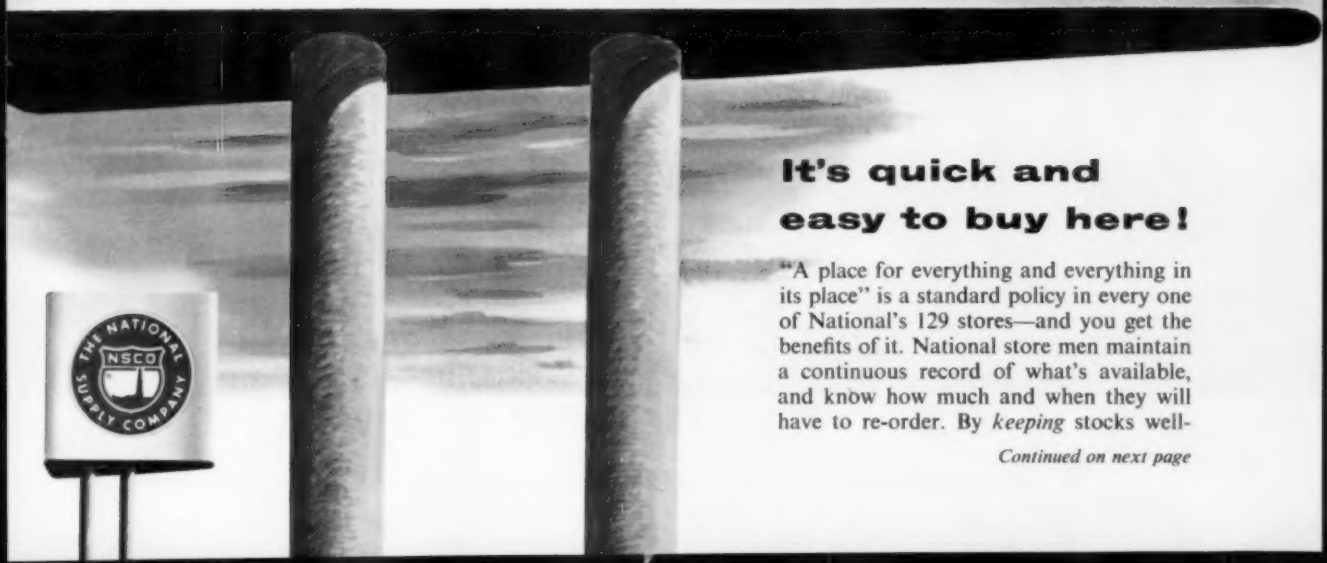
Properly installed and operated within rated conditions, Thomas Couplings should last a lifetime.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.



It's quick and easy to buy here!

"A place for everything and everything in its place" is a standard policy in every one of National's 129 stores—and you get the benefits of it. National store men maintain a continuous record of what's available, and know how much and when they will have to re-order. By *keeping* stocks well-

Continued on next page

Continued from previous page

organized for fast order filling, every National Store provides the buying convenience you need to meet busy work schedules.

Careful stock maintenance, however, is just one of the many buying advantages at National Supply. Here are more benefits you can always rely on: every store inventory is tailored to the needs of the area it serves, and every item in that inventory is a quality, proved-in-service product. Furthermore, all the operating and maintenance instructions you may need are available in helpful, well-illustrated manuals. Complete information on new products is also readily available in printed bulletins.

In effect, you have all the conveniences of a modern supermarket at a National Supply Store. Stop in soon—you'll like the friendly service, too.

More than 3,000 products are stocked in the average National Supply Store. We keep them arranged for your quick and easy selection.

15 reasons why National Triplex Pumps reduce downtime!

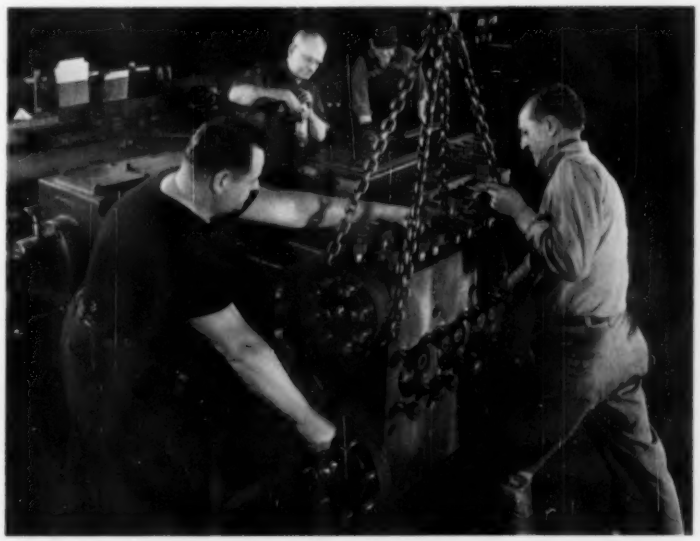
These sound construction features are the reasons why National Triplex Pumps perform at low cost on a host of pumping jobs:

1. Connecting rods equipped with steel backed babbitt lined precision bearing shells.
2. Fluid ends of special alloy for maximum corrosion resistance or non-corrosive service are available for both high and low pressure.
3. Close end clearances in the fluid end plunger cavity, promoting best filling, improving volumetric efficiency and reducing shock and vibration on pump and manifolding.
4. Removable stuffing box cartridges* and plungers make conversion from one size to another possible through use of plunger kits at minimum cost.
5. All packing easily reached for adjustment.
6. A variety of plungers are available for either corrosive or non-corrosive service. All are ground to the finest finish to give the longest plunger and packing life.
7. Stainless steel disc-type valves, giving maximum corrosion resistance and having light moving parts, thus reducing inertia and allowing maximum fluid filling.
8. Suction valves removable through cylinder heads, which allows installation of valves in a single valve pot without complications of valve spacing devices, and maintains interchangeability of all valves. Makes possible straight through fluid flow with minimum end clearance.
9. Low suction elements, assuring better suction conditions than with a vertical pump.
10. Coordinated design of suction passages, valve areas and end clearances, improving fluid filling and permitting higher speed operations.
11. Lubrication of all power end parts is accomplished by a directed splash system. Deflectors positioned in the power frame direct the splash to built-in reservoirs which in turn deliver oil to the moving parts. (On the F-90, a pressure lubrication system, as well as splash lubrication, is standard.)
12. Horizontal design gives larger support area as well as lower center of gravity, thereby reducing vibration.
13. Reversible crankshaft assembly permits direct connected engine drive.
14. Suction and discharge connections arranged for piping from either side of pump.
15. Skids optional for unitized portable mounting.

*Patent Pending

Reduce pumping downtime now with better-built National Triplex Pumps! You can get complete information and fast delivery through the National Supply representative in your area.

These National F-60 and F-90 triplex pumps are in use on a pressure maintenance project in Louisiana. They're equally effective in many other types of applications, including salt water disposal, pilot waterflooding, formation fracturing, and as power-oil sources for subsurface hydraulic pumps.



In National Supply's Toledo, Ohio plant, skilled personnel assemble the fluid end of a triplex pump. The four Triplex pumps (F-15, F-30, F-60 and F-90) in the National Line have a rated input hp range of 16.7 to 100 hp, with fluid ends available for high or low pressure, corrosive or non-corrosive service.

THE **NATIONAL SUPPLY** COMPANY

MAIN OFFICE: Two Gateway Center, Pittsburgh 22, Pa.
DIVISION OFFICES: Dallas; Denver; Houston; Toledo; Tulsa; Torrance
CANADA: The National Supply Company, Ltd., 200 F. W. Clark Building, 709 Eighth Avenue, West, Calgary, Alberta
EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E. C. 1
NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

More quality production equipment on the next page!

This installation in Alabama is a typical example of National Pumping Units and wellhead equipment in use on dual completion wells.

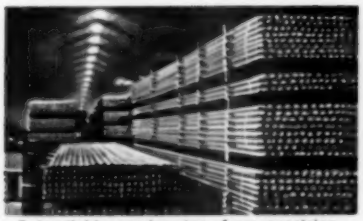
You get low-cost production with National Pumpers, too!

Having trouble with load reversals? National Pumping Units have an extra margin of strength that meets this problem. They have exceptionally hard alloy steel gears and pinions designed for long wearing life. Gear train mounting and main bearings offer lower shaft loading and deflection . . . easily handle shock loads from load reversals.

There are other important National Pumping Unit features that insure dependable operation:

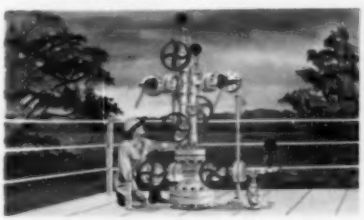
- Easy-to-install, strong main base.
- Exceptionally stable, well-balanced samson post.
- Pitman assembly features easy maintenance, fast assembly.
- Rugged walking beam and beam hanger for extra years of service.

Get the facts on National Pumpers today. For the full story on the high performance and low operating costs they offer, see the National Supply Store men or representatives in your area soon. New bulletins giving the complete story on these quality pumping units are available.



Get reliable service, too, from precision-made National Sucker Rods. They have top resistance to fatigue, shock, corrosion and impulse loads. Available in a range of grades for every condition.

For certain types of wells, the National Plunger Lift can be the best production method. It uses either formation gas or injected gas for operation. See your National representative for details.



Interchangeable units provide many combinations to meet your specific needs in size, capacity and type. Ease of assembly and pre-tested safety are two major features of this National Wellhead Equipment.

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT
SPANG STEEL PIPE AND ELECTRICAL CONDUIT

EQUIPMENT MEN . . . in the News

Rockwell Promotes Five to Centralize Valve Sales . .

in Pittsburgh. The five named to Rockwell Manufacturing Co. sales management posts have been made assistants to Herman Gottwald, recently appointed assistant vice president and product manager, Nordstrom valves.

The appointees are Thomas I. Stacy, former Houston district sales manager, now assistant product manager, transmission line valve sales; Richard E. Miller, former sales supervisor in the New York district, now assistant product manager, valve lubricants and accessories; Jack W. Harris, former Houston senior sales engineer, now assistant product manager, refinery and chemical valve sales; John R. Applegate, former Chicago senior sales engineer most recently attached to the Detroit branch office, now assistant product manager, utilities valve sales; and Clyde H. Chronister, former Tulsa senior sales engineer, now assistant product manager, production valve sales.

U. S. Industries, Inc., Reorganizes Divisions . .

along product group lines. Manufacturing and marketing functions in three of its major divisions are affected, according to John I. Snyder, Jr., president and chairman of the board. The integration of operations is in contrast to the policy of leaving acquisitions and their product lines intact after USI acquired them.

Among the divisions affected is Axelson Manufacturing Co. of Los Angeles and St. Louis, Mo., a major producer of oil-field equipment. It will become USI's production center for oil-field equipment only. It will expand in this field by concentrating on a wider product basis.

Other USI divisions affected are Clearing Machine Corp., Chicago, producers of metalworking presses; and Western Design & Manufacturing Corp., Santa Barbara, Calif., manufacturers of electronic systems and components for aircraft and guided missiles.

Bunce, King, Duncan Named By J&L Supply Division . .

to posts in the sales organization. Robert F. Bunce, salesman, formerly at Williston, N. D., is now located at Billings, Mont. Bill V. King, storeman at Powell, Wyo., is appointed salesman at Williston, and D. R. Duncan, storeman, Farmington, N. M., is appointed salesman at the Farmington store.

William R. Woodward, sales representative, has been transferred from the Lindsay, Okla., store to J&L's Wichita, Kans., sales office, according to W. L. Wolfe, vice president.

Bunce joined Jones & Laughlin Steel Corp. as a sales trainee in 1955 and was transferred to the Supply Division in January 1957. King joined J&L Supply in 1956 as a storeman at Powell. Duncan began his J&L career in 1948 as storeman at Cut Bank, Mont. In August 1957 Duncan was transferred to Farmington. Woodward began his career at Jones & Laughlin in 1954.

Harbison-Fischer Gives Display to Texas A. & M.

The subsurface oil well pumps were given to the petroleum department by L. B. Harbison, sales manager for Harbison-Fischer Manufacturing Co., Fort Worth. The display was presented to the school through R. L. Whiting, head of the department, and his two assistants, S. D. Amyx and B. A. Bishop.

The display includes all standard A.P.I.-type rod pumps and also several special rod pumps manufactured and marketed by Harbison-Fischer. The pumps, which have cut-away sections showing the working mechanism, will be used for demonstration purposes.

Harbison-Fischer also gave similar displays to the petroleum engineering departments of the University of Texas, Oklahoma University and Texas Tech.

Shown with the oil well pump display are, left to right, L. B. Harbison, R. L. Whiting, S. D. Amyx and B. A. Bishop.

Armstrong Cork Co. Merges Insulation Offices . .

JOHN S. TAYLOR

to form the San Francisco-Los Angeles district office, according to A. E. Pearce, general sales manager of the insulation division. John S. Taylor, formerly district manager of the San Francisco office, has been named district manager for the combined operation. Mann C. Sweet, previously of the Los Angeles office, will serve as branch manager at Los Angeles.

Taylor joined Armstrong in 1946 and was appointed district manager at San Francisco in 1953. Sweet, who joined Armstrong in 1947, has been in the Los Angeles office since 1947.

A. B. Callow, district manager at Los Angeles, has retired after more than 45 years with the company.

Carrier Corp. to Move Division's Headquarters

The machinery and systems division will move into a new office building to be constructed in Houston. According to Oscar H. Mehl, southwest regional manager, the building is expected to be completed late this year. Gordon V. Bond, district manager, stated that facilities in the electric building could no longer be expanded.

The Houston district office of Carrier specializes in year-round air conditioning systems for multistory buildings and industrial plants. Other important products include refrigeration machines for process cooling and centrifugal and axial equipment for industrial air and gas compression in the petroleum and petrochemical fields.

Rex Meyers Transfers to National Sales Co. . .

from the parent company, National Tank Co. According to Jay P. Walker, president of National Tank, Meyers will serve as sales and service engineer.

Meyers joined National Tank at its Electra, Tex., branch and was later transferred to Abilene as a sales and service engineer. For the past 4½ years he has been with the San Angelo branch.

William Becker is district manager

of the new sales company headquartered at Los Angeles. Warehouse and stocks are at Bakersfield.

Cardwell Manufacturing Co. Appoints D. B. Arndt . .

sales representative for the Four Corners area. According to Clyde Lackey, domestic sales manager, Arndt will headquarter in Durango, Colo.

Arndt was formerly sales representative for Mechanical & Electrical Equipment Co. He has also served as service manager for Buda Engine Sales & Service.

Collins Radio Co. Names G. L. Johnson, J. N. Hunt . .

as district sales engineers headquartered in Houston and Atlanta, respectively. According to T. W. Sharpe, Texas region sales manager, both men will serve microwave users in their sales areas.

Johnson previously served as a Collins field engineer and as sales engineer for the Dallas area. Hunt was an associate field engineer for Collins before receiving the Atlanta assignment. He was formerly with Lockheed Aircraft and Atlantic & West Point Railroad.

National Tube Division Names Swank, Cramer . .

as manager and assistant manager of sales, plastic pipe, for this division of United States Steel Corp., according to Robert E. Williams, National Tube general manager of sales.

R. L. SWANK

T. D. CRAMER

Robert L. Swank, who will be in charge of the nationwide sales of plastic pipe, succeeds Robert K. Henderson, newly appointed district sales manager in Philadelphia. Swank joined National Tube in 1946 and later served in the sales office in Detroit, the Chicago district sales office and since 1953 has been a resident salesman in Des Moines, Iowa. Swank will make his headquarters in Pittsburgh.

Thomas D. Cramer joined U. S. Steel's commercial research department in 1950. He was named a sales representative for plastic pipe in 1955.

National Tank Co. Moves F. N. Quinalty . .

F. N. QUINALTY

to Pawhuska as acting branch manager. According to Jay P. Walker, president, Quinalty replaces Morris White who is now sales and service engineer with the Ardmore branch.

Quinalty joined National Tank in 1941. In 1953 he was transferred to the Seminole branch as a salesman and served in that capacity until his recent promotion. White started in National's Tulsa plant in 1942. Later he served as shop foreman over high-pressure vessels and in 1954 was transferred to Pawhuska as branch manager.

Wyatt's Plastics, Inc., Expands Plant Facilities

A new plant at Wallis, Tex., to increase manufacturing operations will not be restricted to working with rubber. Its major output will consist of the custom molding of rubber parts and the manufacture of rubber sheet stock. Its facilities also will permit the manufacture of parts that are a combination of rubber and plastics. Another activity is the lining of tanks and pressure vessels with plastics to counteract corrosion.

Wyatt's Plastics is now in its third year of operation. The Houston headquarters and plant adjoin the site of the parent company, Wyatt Metal & Boiler Works.

Waukesha Sales and Service Names M. W. Hiltpold . .

sales engineer for the West Texas division with headquarters at Midland.

Hiltpold has been in the oil-field engine business 12 years. He was with another major engine manufacturer and distributor before joining Waukesha Sales & Service, Inc.

Oil Well Supply Division Moves Knight, Stearns . .

to Woodward and Healdton, Okla., respectively. Byron T. Knight will be field representative and Reaves E. Stearns, field representative, according to Mark Barkhurst, Mid-Continent area manager of the division.

Knight joined Oilwell in 1953 at Oklahoma City and later that year was transferred to Seminole, Okla., as store manager, holding that position until his recent appointment. Employed in 1953 at Pauls Valley, Stearns was appointed field representative at that location in 1954.

Reynolds Metals Co. Forms Service Group . .

to work with the petroleum and chemical industries. Creation of this specialty field service organization is believed to be the first such group set up in the aluminum industry.

According to W. B. Moore, manager of the petroleum and chemical market for Reynolds, seven engineers trained as specialists in applications of aluminum are available for consultation or other assistance requested by the petroleum and chemical industries.

The field engineers include L. V. Sheain, domestic service, and W. H. Caruthers, Jr., international, headquartered at New York; I. C. Scott, Jr., Houston; C. R. Schall, Dallas; D. E. Smith, Los Angeles; Leo Hillman, Tulsa; and Eugene F. Prestera, Maracaibo, Venezuela.

National Supply Co. Names John C. Jett . .

JOHN C. JETT

division sales representative in Pittsburgh for the eastern division. He succeeds William Van Vleet, who has retired. Jett joined the company in 1929 as a clerk in its Paintsville, Ky., store. He advanced to store manager in 1939, district manager for the State of Kentucky in 1941, and district manager for the Kentucky-West Virginia district in 1953.

Continental-Emsco Made Lock-Rite Export Agent

Suitable for foreign operations, Lock-Rite housing units are preassembled buildings in panel form which are packaged in palletized units to facilitate transportation. Lock-Rite Structures Corp. manufactures these units in a wide variety of designs, each completely furnished with all equipment needed for on-the-spot erection and instant use.

Designs for standard units include kitchen, cold storage, bunk, mess hall, sanitary and laundry facilities. Custom-designed units are also available.

Continental - Emsco Co.'s export headquarters are in Rockefeller Center, New York, under the direction of H. E. Lowrey.

Distributor for Olin Aluminum Is Appointed . .

with the naming of Lafayette Steel & Aluminum Corp., Chicago. According to Sam Gurley, Jr., vice president of sales for Olin Aluminum, Lafayette will distribute Olin Aluminum sheet and coil in the Midwest area.

Olin Aluminum is the trade name for aluminum produced by Olin Mathieson Chemical Corp. Lafayette Steel & Aluminum was formerly known as Lafayette Steel Corp. before its expansion into the sale and distribution of aluminum. William H. Hugus is vice president and general manager of Lafayette.

Hycalog, Inc., Announces Appointments, Transfers

Tom Hergens has been named Houston district manager for diamond coring and diamond bits. H. K. (Bo) Ware has been transferred to Shreveport as district manager for diamond coring and diamond bit sales. Vernon Chapman has been made Shreveport district manager for well logging.

A. R. (Andy) Anderson is now district manager for well logging at Lafayette, La., replacing Glenn Clark, who has been moved to Jackson, Miss., as well logging manager.

John Norwood's new post is district manager for well logging at Casper, Wyo.

L. J. Haight Appointed by Johnston Pump Co. . .

as chief engineer for this division of Youngstown Sheet & Tube Co. Prior to this assignment, he was in charge of the company's atomic energy department.

Before joining Johnston, Haight was assistant chief engineer of Western Pipe & Steel Shipyard in San Pedro, Calif.

Weston Appoints Nichols, Walthers and Heilman

Emil Nichols is manager of test equipment sales; A. R. Walthers, manager tachometer sales; and Paul M. Heilman, distributor sales manager, according to W. H. Steinkamp, vice president in charge of sales of Weston Electrical Instrument Corp., a subsidiary of Daystrom, Inc.

Nichols had been with Allen B. Du Mont Laboratories since 1946, serving most recently as manager of the instruments division. Walthers recently sold for Weston in the Cleveland territory, with prior experience in sales of industrial electronic equipment, motors and switch gear. Heilman was formerly national distributor sales manager for Reliance Electric & Engineering Co., after 5 years in sales with General Electric.

Caran and Subsidiary Elect Gray and Gordon

F. B. GRAY, JR.

Frank B. Gray, Jr., and C. E. Gordon have been elected vice presidents of Caran Engineering Corp. and its foreign subsidiary, International Exploration, Inc.

Gray also serves as chief engineer in charge of the spectrometric mud logging division. Gordon, who was one of the founders of the companies, has been in charge of design and manufacturing of special instrumentation.

Allen B. Du Mont Labs Names W. M. Cagney . .

as eastern regional sales manager of two-way radio communications systems. According to Joseph A. Ricca, product manager of the mobile communications department, Cagney will be responsible for management of field sales and distribution of mobile radio equipment from New England to Georgia.

Prior to joining Allen B. Du Mont Laboratories, Inc., Cagney was with Pye Corp. and Link Radio Corp.

Schlumberger Makes Seven Promotions, Assignments

J. M. Kimbrough, formerly location manager at Pampa, Tex., has been promoted to senior sales engineer in the northeast division and will establish an office in Charleston, W. Va. C. E. Tedrow, formerly Schlumberger Well Surveying Corp.'s location manager at Perryton, Tex., has been transferred to Pampa as manager. B. M. Ray is the new manager at Perryton.

H. J. Nickel is sales engineer for the Kansas division. He was transferred from the post of manager at Shawnee, Okla. M. R. Curtis is now sales engineer at Fort Morgan, Colo., and J. V. Crues has become sales engineer at Dallas.

R. E. Bayles, formerly location manager at Riverton, Wyo., has been named manager of the Casper office.

L. B. Foster Co. Adds Raymond B. Johnson . .

to the sales staff of its New York office. According to Charles G. Hugus, Jr., vice president, Johnson will serve as a specialist in pipe sales.

For the past 3 years Johnson has been a salesman for pipe valves and fittings in the New York area. He has also held sales positions with National Tube Division of U. S. Steel Corp. and Glidden Co.

Rector Well Equipment Co. Adds R. D. Goodnight . .

as sales representative. According to J. L. Pinkard, sales manager, Goodnight will work out of the Pampa, Tex., warehouse.

Prior to joining Rector, Goodnight was with Seismograph Service Corp., J & L Supply and Foster Testing Co.

Pittsburgh Coke Promotes John H. Caldwell . .

to assistant sales manager, protective coatings division. According to Arthur E. Gray, general manager of this division of Pittsburgh Coke & Chemical Co., Caldwell will supervise the field sales force and regional sales managers in New York, Chicago, Houston, and Los Angeles. He was formerly regional sales manager in Houston.

J. H. CALDWELL

Caldwell will be responsible for an expanding market effort since addition of the sales force of Insul-Mastic, Inc., a newly acquired subsidiary. The division is now marketing the gilsonite-asphalt mastics produced by Insul-Mastic, in addition to its own line of tar-base coatings.

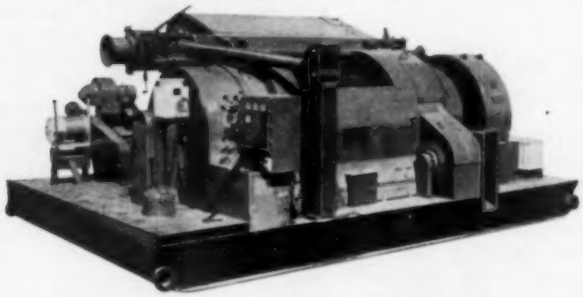
Blaw-Knox Co. Promotes Virgil J. Hostler . .

to eastern district engineer of the company's chemical plants division. He will be located in New York City with responsibility for division sales activities in eastern New York, northern New Jersey and all of New England.

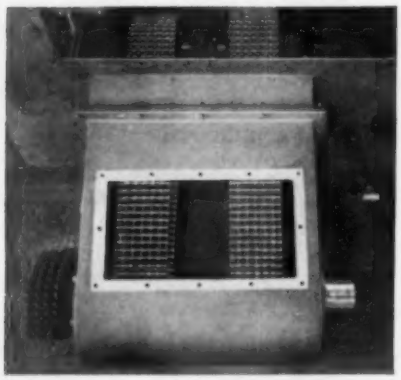
Hostler has been with chemical plants division since 1941. He has served as a design engineer and project manager in the engineering and construction of plants for the chemical, nuclear, petroleum and other process industries.

◆ The caravan starting out from Odessa. Great Western Drilling Company's 3500 horsepower diesel-electric Rig No. 44 is slated to drill a 22,000 foot test for its first job.

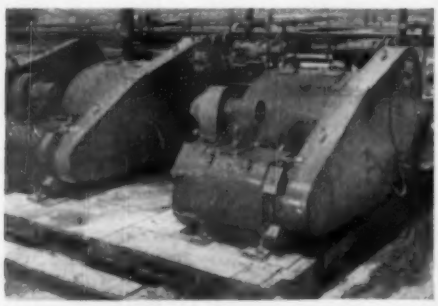
◆ Rig No. 44 was loaded on 17 tractor-trailers, moved 125 miles to location and was ready for spudding in three days.



◆ Unit Electra-Flow Draw Works has triple strand 2½" pitch Diamond Extra Heavy Chains on the drum drive and sextuple 1½" pitch Diamond Chain on the input drive.



◆ The Unit Rig U-1220 E.B. high and low drives from electric motors to the draw works are 1½" pitch sextuple Diamond Roller Chain.



◆ Quad. 1½" pitch Diamond Chains drive two D-700 Continental Emsco mud pumps.

DIAMOND ROLLER CHAINS

Deliver the Power for Texas' Deepest Well

On *all* drilling jobs, and certainly on one as big as this, durability and efficiency of the drilling rig and power drives are of vital importance.

Drilling 22,000 feet means three to six times average depth. Here is where the proven performance, ruggedness and uniform quality of Diamond Oil Country Roller Chain drives insure steady production and lower drilling costs.

On the big U-1220 E.B. you'll find Diamond Roller Chains on input, drum and cathead drives. Power drives on the two Emsco D-700 mud pumps are Diamond also.

To get the most performance for *your* dollars, insist on Diamond Roller Chains!

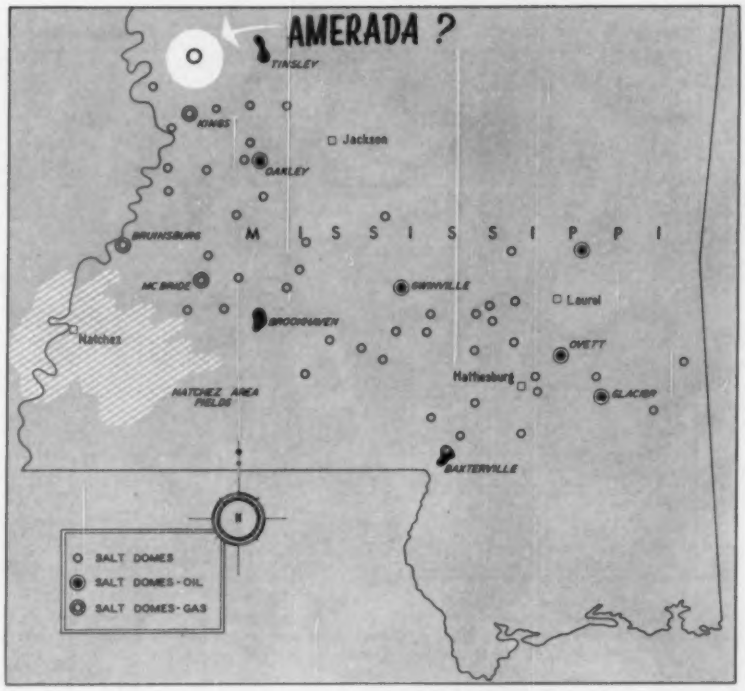
DIAMOND CHAIN COMPANY, Inc.
A Subsidiary of American Steel Foundries
Dept. 475, 402 Kentucky Avenue, Indianapolis 7, Ind.
Tulsa Office: 2238 Terwilleger Blvd.
Offices and Distributors in All Principal Cities
Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS

EXPLORATION

How to Hatch a Glass Egg

by Frank J. Gardner
Exploration Editor



AMERADA Petroleum Corp. may have discovered Mississippi's fifty-second salt dome in Sharkey County; Lower Cretaceous production was opened here in late 1956 (Valley Park field).

A BELT of 51 known salt domes stretches across the waist of Mississippi. Salt has actually been penetrated on 38 of them. But only eight have ever produced commercial oil or gas. A confirmation test now drilling in Sharkey County's Valley Park field is threatening to add a fifty-second dome to the list, and a ninth producer. Amerada Petroleum Corp. et al 1 U.S.A.-Vaughey (Section 32-10n-6w) had, at last report, penetrated 244 ft. of solid salt at total depth 12,665 ft.; operators are not sure yet whether it's domal salt or bedded salt, but all signs point to a new dome for Mississippi.

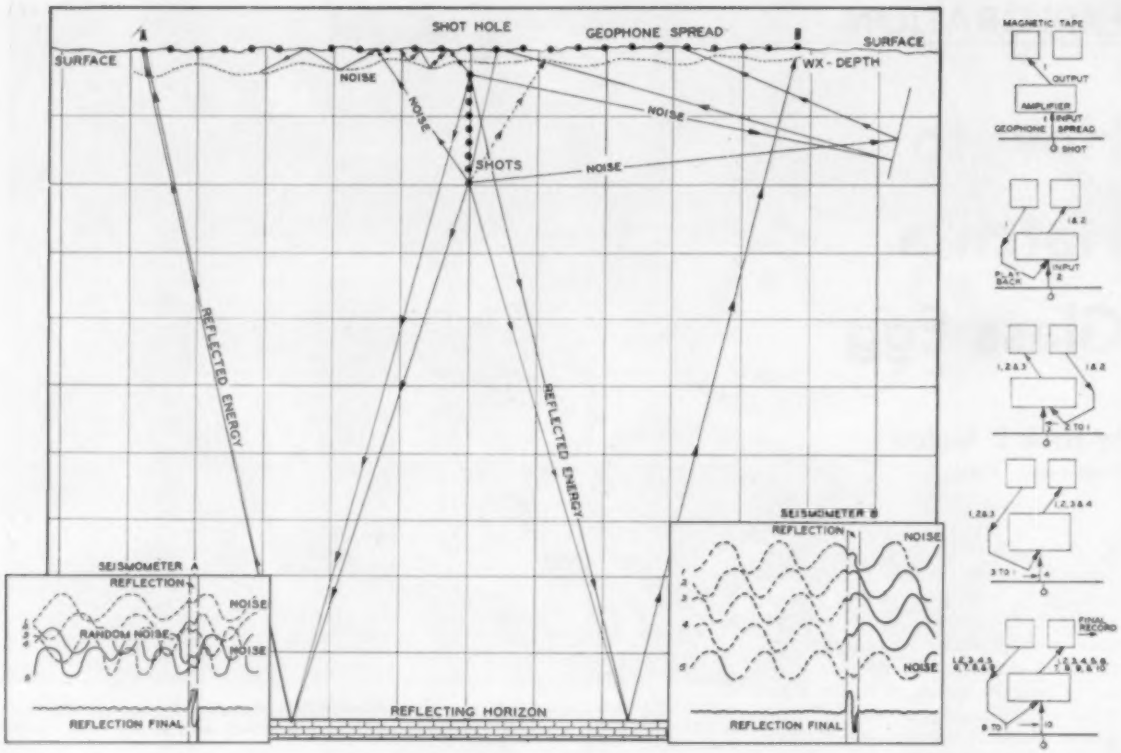
Glass eggs . . . But discovery of a new dome here is like finding a glass egg. It's hardly news, and it only makes for more confusion. At the same time, it's an encouraging sign for oil finders and lends further support to the belief that all or most of Mississippi's puzzling plugs should eventually be tapped for production.

Mississippi is not alone with this enigma. A similar nest of glass eggs lies in northern Louisiana, another in South Texas, and another in deep East Texas (OGJ, June 18, 1956, p. 341; March 25, 1957, p. 287; and June 3, 1957, p. 167). The riddle of the nonproductive salt domes is one of the great challenges facing geologists today.

The first shallow salt dome found in Mississippi was Midway, in Lamar County; Sun Oil Co. discovered it in 1937, and a lively search for more domes ensued. Many were found. But it was not until 1944 that first production was found; this was gas at Bruinsburg dome, in Claiborne County. It flowed 5,000 M.c.f. per day from Moody's Branch sand (Jackson-Eocene) at a shallow 935 ft. Kings dome in Warren County became a gas field in 1946, with production of 7,200 M.c.f. from the Wilcox-Eocene at 2,510 ft. And in the same year, McBride dome (Jefferson County) became a small gas producer from Yegua sand at 1,452 ft. The first commercial oil on a piercement salt dome came from 7,000-ft. Tuscaloosa and Eutaw sands at Glazier field, Perry County, in 1952. Earlier, oil had been found in Gwinville, Ovett, and Heidelberg fields overlying deep-seated salt cores. The Glazier discovery renewed the search for shallow salt-dome oil for a time, but only one other similar field has been found and that was on the Oakley dome in Hinds County—this one was a 2,400-ft. Wilcox strike in 1954.

In the path of a shock wave . . . In 1956, a couple of Texas discoveries sent shock waves all through the Gulf Coastal Plain. In Wood County, East Texas, British American opened the deep Hainesville salt dome to first production; at about the same time, The Texas Co. announced success on the Bethel dome in Anderson County to the south. Immediately, the "dry" salt dome again became a prime target for the leasehound, and waves of eager leasing swept across East Texas, northern Louisiana, and southern Mississippi. The frenzy was whipped even higher in June of this year when Pan American Petroleum Corp. found gas and condensate production on the Minden dome in North Louisiana's Webster Parish. The lease play is described by landmen as "one of the fastest and wildest in Mississippi's oil history . . . Buying outlines were usually confined to 1 to 1½-mile bands around each dome . . . the shape of a doughnut, as the top of the dome was left open." Bonuses jumped from $2 to as much as $25 per acre, as 200,000 acres changed hands for more than $2,000,000. Consequently, you have to scratch to find any open acreage on any Mississippi salt dome today.

May yet produce . . . So we're poised again for a salt-dome search. A few discouragements, and the interest will wane again. A few hits, and it will spiral. So goes oil exploration. But Mississippi operators will do well to study the approach used by British American in Texas and Pan American in Louisiana. Both these companies devoted long months and huge sums to thorough geophysical study and deep-drilling operations. The answer to success lies in a new geophysical approach, detailed subsurface study, and revitalized interest on the part of Mississippi's geologists.



NOISE obscures the reflected energy arriving at seismometers A and B. Energy from the first shot is stored on a magnetic tape (column on far right). This is blended or integrated with the energy from the second shot and stored on magnetic tape. The process is repeated until a usable record is obtained (compare final reflections at seismometers A and B). Fig. 1.

New seismic method magnetically integrates seismic data in the field

By Norman S. Morrisey
Drilling Development Editor

With this method, seismologists have overcome another obstacle that has barred the successful mapping of many hard-to-shoot areas. A new technique enables the oil finder to obtain usable records in many areas where noise and other field problems render normal field methods useless.

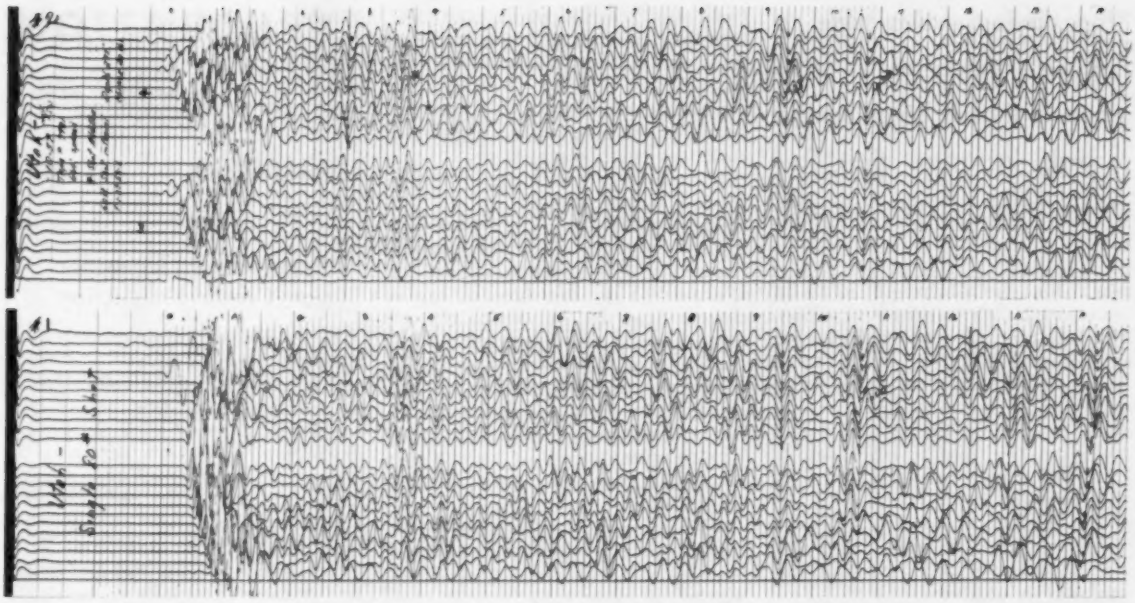
Basically the method is simple, just adding up or integrating the net effect of several shot holes. With magnetic tape recorders and electronic instruments, it is possible to add up several seismic records from the same or adjacent shot holes. True reflections tend to reinforce each other; noise* tends to cancel out. The result is a clean record in many instances that can be interpreted.

Past attempts . . . Noise has always bothered the geophysicist, cluttering up records and, more often than not, rendering them useless. Filters have been used at times to eliminate certain types of noise, but the results are not always desirable. Invariably the noise has a fairly broad spectrum (that is, occurs over a fairly wide band of frequencies) and cannot be eliminated effectively without seriously destroying the usable seismic energy. Filters can be used successfully when the reflected energy and the interfering noise are of different frequencies. Unfortunately, however, in most cases, the reflecting energy and the noise occur over the same broad spectrum, making it impossible to obtain usable records in many noisy or hard-to-shoot areas.

Multiple geophones, too, have been of value for reducing noise to a minimum. But even this approach has been useless in many areas because the interfering noise is so much stronger than the reflected energy, completely masking it.

Noise, however, differs from reflected seismic energy, because it is random in nature as a rule. Reflected seismic energy follows a definite wave path and a definite wave form: Two shots at varying depths from the same shot hole will not produce the same noise components because of the random nature of noise. But reflected

*Noise is defined here as: Extraneous energy appearing on the seismic records that masks the usable reflected energy.



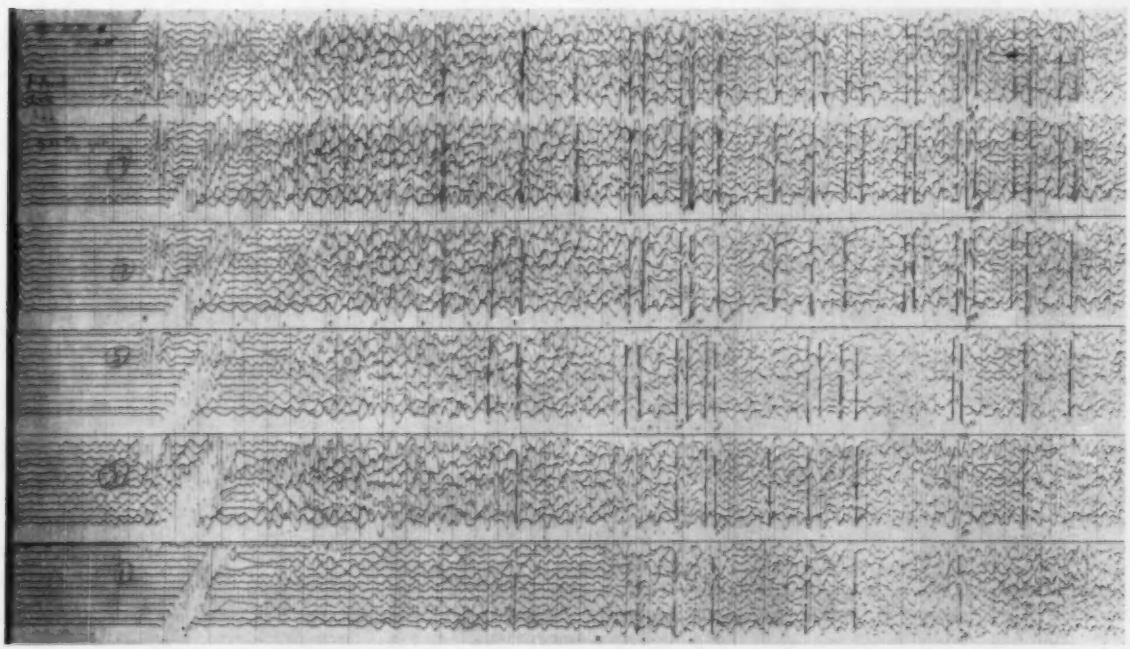
THE LOWER RECORD is the integrated result of four shots of 20 lb. each spaced 60 ft. apart in the same shot hole. The upper record at the same spot is an 80-lb. shot. The deep reflections on the upper record apparently are the result of noise or "ghosts" and are eliminated on the integrated record. Fig. 2.

energy, though weaker than the noise, follows the same path in given sequence.

Thus, adding or integrating a series of seismic records from a given shot hole or adjacent shot holes will accentuate the true reflections since they are in phase and the sum total of any given reflection will be additive. Noise, by virture of its random nature, will not occur in phase on each record. The net effect of integrating properly a series of records will be to destroy the noise even though on the initial record it completely obliterates the usable seismic energy or reflections.

In theory . . . Fig. 1 shows theoretically how the new magnetic integration method works. Seismic energy is generated in the shot hole by the dynamite explosion. The two seismometers at A and B pick up the reflected energy that bounces off the reflecting bed, but this is completely hidden because of the noise.

A second charge is detonated, 10 ft. above the first, but again the noise hides the reflection. Similarly several



HERE WE SEE how magnetic integration improves record quality. The lowest seismogram in this suite of records was shot first; the uppermost is the tenth in the sequence from the same shot hole and is the integrated sum of the energy from the 10 shots. Fig. 3.

"The obvious advantage to the new integrating technique is that it gives usable records in areas that formerly could not be mapped."

other shots are discharged at 10 ft. intervals above the first and second. The result is five records from each seismometer, A and B, but it would be impossible to identify the reflection on each (see inserts labeled seismometers A and B, Fig. 1). However, when the five records are added or integrated, the reflection appears on the integrated trace. The noise is virtually eliminated and it would be a simple matter to correlate the prominent reflection recorded on both seismometer A and seismometer B.

And in practice . . . The seismic energy is recorded on magnetic tape for each shot. This energy can be stored on separate tapes and integrated selectively later or the integration can be carried out in the field as shooting progresses. The latter approach is the better, because the observer can inspect the integrated record and evaluate the quality of the data. When he has obtained a usable record, he can then go on to the next shot hole.

Normally the energy from the first shot is recorded on magnetic tape. This tape is fed through a series of demodulators and attenuators that integrate or mix the energy from this first shot with the energy from the second shot. The dynamite is lowered into the hole for the second shot; the observer applies a time correction to the magnetic tape equal to the difference in uphole times between the first and second shots. This insures that the reflections on each record will be arriving at essentially the same time. The second shot is detonated automatically by the magnetic tape to insure that the reflections from the first and second shot will be in phase. The energy from the two shots is integrated automatically to give a composite record, or the summation of the seismic energy recorded on each shot.

The process is repeated on the third shot and so on until the desired integrated record is obtained. The instruments are so arranged to weight each shot mathematically. Thus the integrated record obtained from the third contains two-thirds of the seismic energy from the second magnetic tape and one-third the energy from the third explosion. Similarly the magnetic tape from the second shot contains half the energy from the initial shot and half the energy from the second shot. Thus on the fifth shot, the energy recorded on the integrated record is the sum of the five shots, each shot contributing 20 per cent of the total energy appearing on the integrated record (see Fig. 2).

The uphole time corrections are carefully determined in this manner. A series of geophones are lowered on a cable into the shot hole. A cap is detonated on the surface and the energy reaching the geophones is recorded in conventional manner in the recording truck. This gives a very accurate check on uphole times or time differences between respective shots. The observer can simply make a correction for each shot as the shooting progresses.

Although the new technique is designed primarily for shooting several shots in the same hole at different depths, it will work equally well using adjacent shot holes.

Advantages . . . The obvious advantage to the new integrating technique is that it gives usable records in areas that formerly could not be mapped. In some instances, it may save on power. For example, Fig. 3 compares a conventional record (upper record) from the Four Corners area with an integrated record based on four shots. The conventional record used 80 lb. of dynamite for one record; the better quality integrated record is the result of four shots at 20 lb. each.

Another advantage is that the new method will permit shooting in areas where dwellings, farm buildings, or other installations formerly prohibited shooting.

Another big factor is that the observer can integrate the data in the field and determine the final record quality. On top of that, filtering of the raw seismic data is held to a minimum.

Inventor of this new magnetic integrating method for handling seismic data is Edward G. Schempf, president of Precision Exploration Co., Tulsa. He has assigned the patent to Precision Exploration Co. and this company already has several units in the field. Schempf states that the added cost of his instruments over and above the normal magnetic tape recording instruments is nominal, probably adding less than 2 per cent to the total cost of the seismic survey per month.

The integrating instruments can be installed in conventional recording trucks, although Schempf advocates a slightly larger truck with air-conditioning. To speed up field production, a cable truck should be used.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Dalton Gasser Extends Sugar Creek Production

E. M. Shields and associates have completed a good gasser 1½ miles east of two small wells south of Dalton, in Sugar Creek Township, Wayne County. It is their 1 C. F. Hostettler, in Section 13, which flowed 570,000 cu. ft. of gas per day, natural, and 1,500,000 cu. ft. per day, after fracturing. Production is from Red Clinton at 4,116-47 ft.

East Ohio Gas Co. has brought in two extension gas wells in the northeast corner of Baughman Township, in the same county. One, its 1 Clapper, in Section 1, flowed 1,500,000 cu. ft. of gas per day, natural, and 9,215,000 cu. ft. per day, after fracturing. The other, 1 C. Brettenstine, in Section 12, made 500,000 cu. ft., natural, and 3,000,000 cu. ft. after fracturing. Both produce from the Clinton, the former at 3,810-28 ft., and the other at 3,803-37 ft.

Rochester & Lamp 1 Moran, a new field well in Jackson Township, Muskingum County, gaged 600 bbl. of oil in a 24-hour test after fracturing sand at 3,009-73 ft. It had filled 1,500 ft. in 12 hours, natural. Location is in Section 6.

PENNSYLVANIA

Wildcat Gas Well Gaged In Buffington Township

Final gage of Columbian Carbon Co.'s new wildcat gasser in Buffington Township, in Indiana County, was 4,000,000 cu. ft. of gas per day, after fracturing Oriskany sand at 8,220-26 ft.

The new well, 1845 Bethlehem-Cuba Iron Mines Co., had the Onondaga at 8,114 ft., and the chert at 8,128 ft.

WEST VIRGINIA

Licking District Wildcat Completed As Gas Well

In Licking district, Tucker County, Hope Natural Gas Co. No. 10097 Arlie W. Myers, a wildcat, has been completed with open flow of 8,540,000 cu. ft. of gas per day. Its rock

pressure was 1,960 psi. in 3 hours. Gas is at 4,800-04 ft.

In the Hamilton district, Nichols County, Hope has started operations in its No. 10120 Rosali Duffy wildcat. Location is in Summerville Quadrangle, 0.80 mile south of latitude 38 degrees 25 minutes, and 2.40 miles west of longitude 80 degrees 45 minutes. Its elevation is 1,879 ft.

EASTERN KENTUCKY

On Trace Fork, in Magoffin County, Victor Hale has completed 1 E. J. Wireman as a shallow Pennsylvanian Salt sand well. Bottomed at 933 ft., it flowed at the rate of 263,000 cu. ft. of gas daily.

ARKANSAS

New Falcon Area Test Aims at Smackover Pay

Another attempt is being made to find Smackover production in the Falcon area, of southern Nevada County, in the southwestern part of the state.

It is by Coulston Drilling Co., of Tyler, Tex., whose new deep test is a little more than a mile southeast of Falcon, and about 1,700 ft. west of the Falcon shallow (Cretaceous) producing area.

Spot location of the test, 1 Cox, in 9-15s-22w, is about a mile north of the nearest deep fest, drilled early in 1940, and abandoned at 6,028 ft. It topped the Smackover at 6,022 ft. with surface elevation of 310 ft. Coulston's test is scheduled to go to 6,200 ft.

CALIFORNIA

Paloma Outpost Produces From New Deep Oil Pool

Superior Oil Co. has a good discovery more than a half mile south of Paloma field in Kern County. The new well, 85-10 KCL, is flowing 200 bbl. daily of 56.1°-gravity crude from a new pool in the Paloma sand at 10,021-50 ft. Flow is through ⅞-in. choke. Production cut 0.6 per cent. Superior took the test to 10,415 ft., total depth.

Testing to Continue on Cat Canyon Discovery

Bishop Oil Co. planned to continue tests on its wildcat in the Cat Canyon area of Santa Barbara which flowed 14 bbl. in 16 hours on its initial production test. The crude tested at 12° gravity and was 32 per cent cut. The selectively perforated intervals in this shallow discovery are at 2,002-2,457 ft. and 2,592-2,830 ft.

Extension Producers Spur Belgian Anticline Play

Activity in the Belgian Anticline field of Kern County is highlighted by successful extension tests in the Forbes and Northwest areas.

The successful operator in the Forbes area is Superior Oil Co. which has extended production there more than 1,500 ft. southwest. The new well, 2 Forbes, is flowing 73 bbl. daily of 43.7°-gravity crude from perforations at 3,522-48 ft.

Ohio Oil Co. scored in the northwest area with a southeast extension test about midway between the northwest and main areas of Belgian Anticline field. The well, 6 F. E. Smith Government, flowed 35.5°-gravity crude, 6 per cent cut, at a 30-bbl.-hourly rate on drill-stem test at 5,880-5,911 ft.

Gosford Discovery Offset

Universal Consolidated Oil Co. is wasting no time in following up on its new-pool discovery in the Gosford area, Kern County. Drilling already is under way at northeast offset in an attempt to confirm the discovery. The significant discovery well, 14-19 Statex-KCL, is making 300 bbl. daily of 34°-gravity crude from four perforated intervals between 9,620-9,773 ft. Flow is restricted to 5/32-in. choke.

CANADA

ALBERTA

Basal Quartz Production Indicated in Sundre Area

Hudson's Bay Oil & Gas Co., Ltd., has discovered oil in the basal quartz formation at a field development well in the Sundre area of southwestern Alberta. The well was drilled primarily to take its production from the Elkton zone of the Mississippian, but found that formation not developed in the northeastern fringe. Company officials then decided on a side-wall coring and testing program. It was because of those operations that the new oil-bearing horizon was found. Further coring and testing operations are underway at higher elevations.

With the oil discovery a gas flow at the rate of 8,500,000 cu. ft. daily was recorded. The well, Sundre 11-10 on LSD 11, 10-34-5w5, is ⅝ mile northeast of previous Elkton production. The field at this point is about 60 miles northwest of Calgary's city limits.

Basal quartz was topped at 8,730 ft. The drill-stem test covered a 44 ft. interval below 8,834 feet. Gas surfaced in 19 minutes. Pipe recovery was 2,200 ft. of oil.

Minnehik-Pembina Play Gets 4-Mile Extension

Alida Oil Co., private English firm, and a recent entrant into the Western Canadian oil scene, reports that a well it has been drilling in the Minnehik-Pembina area of Central-West Alberta has discovered gas in the Mississippian horizon.

This strike, Alida-Minnehik No. 7-1, on LSD 7, 1-46-6w5, is 9 miles southeast of the closest Cardium oil production in the Pembina field and 4 miles southeast of the Delhi-Minnehik No. 2 Mississippian gas success.

During two drillstem tests in the horizon, gas flow-rates up to 5,690,000 cu. ft. daily were recorded. The second had a pipe recovery of 25 ft. of distillate.

Stratigraphic Test Finds Gas Cadomin Formation

Imperial Oil, Ltd., has discovered gas in the Cadomin formation at well in northwestern Alberta which was drilled as a stratigraphic test on acreage in the region recently sold by the provincial government. The assumption that the well might have indicated more than the gas production, was indicated when the parcel was purchased for a sum of almost $4,000,000. That was borne out by the announcment which also reported a drill-stem test in the Triassic-Boundary Lake formation, productive in the northeastern British Columbia field, 9 miles west. Only 3 feet of that zone was present in this hole, but it is believed that more southern tract

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recently purchased will contain a thicker development of that zone.

This strike, Imperial-Neptune No. 10-27, is going down on LSD 10, 27-85-12w6. It is 95 miles west of Peace River townsite, and 22 miles north of the closest previous driller on the Alberta side of the border, Sinclair Atlantic No. A-5-1, a wildcat dry hole.

Drill-stem test in the Cadomin, covering a 29 foot interval below 3,725 ft. gassed at the rate of 2,310,000 cubic feet daily and sprayed oil to surface during its 30-minute duration. A pipe recovery of 780 ft. of muddy gassy water was made.

BRITISH COLUMBIA

Cadotte Zone Produces In Dawson Creek Discovery

Pacific Petroleums, Ltd., Westcoast Transmission Co., and Scurry Rainbow Oils, Ltd., have discovered gas in the Cadotte zone at a well 5 miles north of Dawson Creek, British Columbia. In drill-stem tests, the well and flowed at rates up to 3,640,000 cu. ft. daily while covering an interval of 89 ft. below 2,701 feet. Various pipe recoveries were made. The last three tests had fresh water with the gas flows.

The well, Pacific-Scurry-Dawson Creek No. 1, on LSD 1, 15-79-15w6, is 35 miles southeast of Fort. St. John townsite, and 2 miles south of the Pacific Peace River No. 8 abandonment.

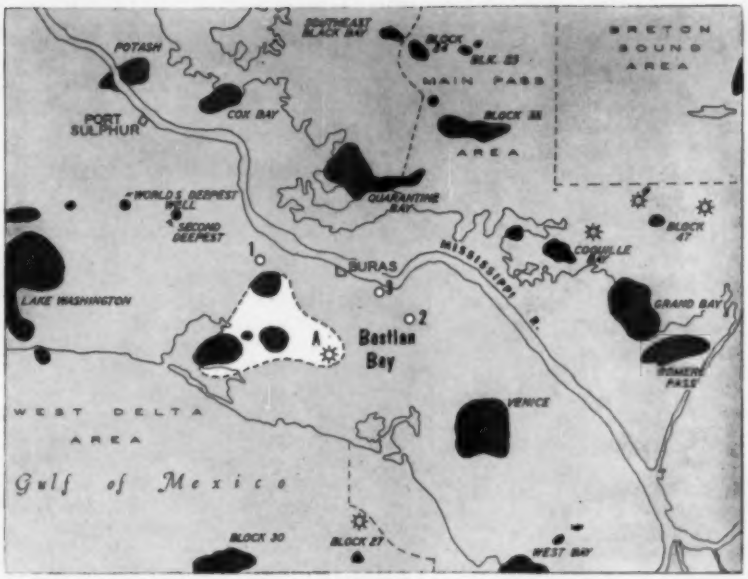
KANSAS

Old Rush County Wildcat Makes Lansing Discovery

Aylesworth Drilling Co. appears to have an exceptionally good Lansing oil discovery in northern Rush County. Its discovery well, 1 Herman, in 13-16s-18w, a little more than a mile south of the Ellis County line, and about 13 miles southeast of Hayes, in the latter county, is in an old wildcat hole, drilled in 1946.

Aylesworth, which recently took over the 2,745-acre lease following geological work by D. C. Marchand, of Wichita, deepened the hole 85 ft. to the Reagan, topped at 3,665 ft. (subsea 1,656 ft.). It had Lansing at 3,293 ft. (subsea 1,295 ft.) and residue Arbuckle at 3,577 ft. (subsea 1,568 ft.)

With hole plugged back to 3,450 ft. in the Lansing, casing perforated at 3,424-39 ft., and pay acidized with 2,750 gal., the well swabbed initially up to 18 bbl. per hour, and then settled at 12 bbl. per hour.



DRILLING depths will reach below 12,500 ft. in the Bastian Bay hotspot. Nearly a dozen rigs are running in this area.

Louisiana's Bastian Bay Area Takes Gulf Coast Play

by Neil Williams

Spreading development in the Bastian Bay area fronting on the Gulf of Mexico on Plaquemines Parish's south coast has brought into play the greatest concentration of deep drilling anywhere on the Louisiana coast.

With nearly a dozen active operations within its present productive confines, it has taken the lead over the neighboring Lake Washington, where the number of deep-drilling rigs has dropped to 8 from a recent peak of 14.

Three additional rigs are running at deep step-out wildcat locations (see 1, 2, and 3 on map) 1 to 3 miles north and east of present productive area.

All drilling now under way and new work being undertaken is destined to depths below 12,500 ft. Much of it is projected to depths from 14,000 to 16,000 ft.

The active drilling play now going on is inspired by a succession of major extension and new-pay discoveries within the past year and a half. Latest discovery, by Tidewater Oil Co. at its 1-A Abercrombie (A on map), extends the prospective productive area at least 3 miles southeast of the original Bastian Bay field, and thus paves the way for a possible continuation of present active drilling, if not a further increase in the number of rigs operating.

Tidewater's discovery well was completed late in September with gas and condensate production from a 13,650-ft. sand after being drilled to 14,600 ft. Tidewater now is drilling at another outpost location about 3,500 ft. farther southeast.

This new area, on the far southeast, stretches the over-all producing area a distance of more than 8 miles, west to east, from the most westerly well so far in what originally was designated West Bastian field (shown on map at southwestern extremity of dotted outlined area).

Discovery of the latter area late in March 1956 by Pan American Petroleum Corp., then known as Stanolind Oil & Gas Co., was largely responsible for initiating more intensified development and spread of drilling in the general area. That discovery well was drilled to 15,408 ft., and completed as a gas-condensate producer from a 14,500-ft reservoir.

The original Bastian Bay area, shown on the accompanying map near the bottom-center of the outlined

area, was discovered by Phillips Petroleum Co. in August 1941. Its discovery well was a prolific oil producer from a 9,350-ft. sand, and gave evidence of commercial gas-condensate, or gas production from at least three shallower sands. Through 1955, 8 wells, productive of oil, gas-condensate, or gas, had been completed in this area from at least 10 separate reservoirs ranging in depth from 6,200 to 11,200 ft.

Pan American's (Stanolind) discovery in the West Bastian Bay area which started a new spurt in development was followed quickly, in March 1956, by another major extension several miles north. Around this extension, there is developing another important area, shown at the northern extremity of the outlined area on the map.

So far, 28 wells have been completed with production from at least 16 separate reservoirs, ranging in depth from 6,200 ft. to below 14,500 ft. Seven of the 28 wells have been dually completed. Eighteen wells are classified as oil producers. The others are productive of condensate and/or gas.

Of the present active drilling operations, eight are now at depths below 12,000 ft., and barring mishap, should be added to the list of producible wells within the next few weeks. Four are drilling below 14,000 ft., with one of these below 15,000 ft. Active operators in the field are Phillips Petroleum Co., Pan American Petroleum Corp., and Tidewater Oil Co.

In addition to its field operations, Phillips has a deep wildcat test drilling about 2 miles north of present production at its 1 State Lease 3091-Adams "D" (shown at "1" on map). Hunt Oil Co. and Pan American Petroleum Corp. have a deep prospective extension, or new-field well at their 1 L.L.&E. ("2" on map), about 3½ miles northeast of Tidewater's recently completed southeastern extension well. The Hunt-Pan American well is testing showings in sands below 13,000 ft. Northwest of this at "3" on map, is Texas Gulf Exploration Co.'s Smith-State Unit 2624 deep operation.

LOUISIANA

NORTH

Shallow Wilcox Oil Field Found in LaSalle Parish

A Wilcox oil-discovery 1¼ miles west of Olla field, in northern LaSalle Parish, is reported by George Belchic, Mercury Drilling Co., and associates.

This discovery well, 1 Mills et al, flowed about 30 bbl. of oil per day with an unestimated volume of gas while testing perforated interval at 2,787½-91 ft. in hole drilled to 2,930 ft. Wilcox had been topped at 1,561 ft.

The discovery, in 33-10n-2e, is about 3¼ miles southeast of Tullos.

Concordia Parish Gets Sparta Sand Discovery

Sparta sand is proving productive in a new oil discovery 2 miles west of Warnicott, in Concordia Parish, eastern Louisiana. Nearest production, in Deer Park field, 1½ miles southwest, is from Wilcox sand. Esperance Point field, 2 miles southeast, also produces from Wilcox sand.

The new discovery is by Marlin Exploration, Inc., at its 1 Magee-Evans, in 43-6n-9e. While cleaning through 9/64-in. choke, the well flowed at the rate of 96 bbl. of oil per day with between 10 and 11 bbl. of basic sediment and water. Pressure on the tubing was 215 psi.

Its Sparta pay is perforated at 3,224-25 ft. Hole had been drilled to 6,813 ft. Nearest other Sparta production is in Larto Lake field, 20 miles southwest of Catahoula Parish.

SOUTH

Austral Opens New Field In South Cameron Parish

Austral Oil Exploration Co.'s new discovery well in southern Cameron Parish flowed at the rate of 1,445,000 cu. ft. of gas with 21 bbl. of 61°-gravity condensate per day for its potential test. Flow was through ⅛-in. choke under pressure of 4,770 psi. Its Miocene sand is perforated at 10,341-47 ft. It was drilled to 10,920 ft.

The well, 1 Helier Savoie, in 19-14s-6w, is one of a long succession of deep gas-condensate discoveries in Cameron Parish's coastal marsh region within the last several years. Nearest production is the Chenier Perdue, 2 miles northwest.

Chenier Perdue's discovery, and so far only well was completed in December 1955 with gas-condensate production from a 9,600-ft. sand. About midway between it and the new discovery Austral has location for another deep test, its 1 Miami Corp.

Lake Arthur Area Gets New Deep Oil Discovery

Potential flow of Tennessee Gas Transmission Co. newly completed discovery well in southeastern Jefferson Davis Parish is rated at 173 bbl. of 40.2°-gravity oil per day through 7/32-in. choke. Flow is with gas-oil ratio of 400 cu. ft. per bbl. and pressure of 5,400 psi. Its pay is perforated at 12,808-10 ft.

The new discovery, at 1 Morgan Plantation, in 38-11s-4w, is about 2½ miles northwest of the one-well South Lake Arthur field, Vermilion Parish, and 4 miles southeast of the prolific deep Lake Arthur field, in Jefferson Davis Parish.

MICHIGAN

Reynolds Outpost Fails

The third of a series of exploratory tests which McClure & Hartman have been drilling south of Reynolds oil field, in Maple Valley Township, Montcalm County, has failed to find commercial showings and is expected to be abandoned.

This test, 1 Arbogast, in the SW SW NW 8-11n-9w, logged anhydrite at 3,300 ft., and carried a show of dead oil at 3,330 ft. and water at 3,381 ft.

Wexford County Wildcat Tests Gas in Stray Sand

A rank wildcat test being drilled by Sun Oil Co. and Superior Oil Co. in Cherry Grove Township, in Wexford County, has encountered a good gas flow in Michigan Stray sand, logged at 1,291-1,340 ft. This strongly indicated new production is being passed up for the time being to deepen the hole to its original objective about 4,000 ft. at the Dundee and Monroe horizons.

Gas flow was during a drill-stem test of the above indicated pay. Flow was logged at 3,750,000 cu. ft. of gas daily.

Location of the wildcat, 1 Stites, is in the SE SE NE 12-21n-10w. It is about 18 miles north of Reed City field, nearest production.

Deeper Pay Opened In Oceana Discovery Well

A deeper zone has proved productive in Swan & Harvey's discovery well completed earlier this year in Oceana County. The well, 1 Skidmore, in 15-16n-16w, originally was completed in the Dundee, at 2,514 ft. It has been reworked to the Reed City zone, at 2,627 ft., from which it is pumping 12 bbl. of oil per day. The Dundee zone produced up to 20 bbl. of oil per day, making 800,000 cu. ft. of gas with the oil.

NEVADA

Deepening Under Way At Two Clark County Tests

Bonanza Oil Co. is drilling ahead on its 1 Government-Consolidated wildcat, 10 miles southeast of Las Vegas, in Clark County. Bonanza reported oil shows at 740 ft. This well had been idle since last April at 634 ft. before Bonanza recently decided to resume operations with cable tools.

Another previously idle test, IX Wilson, 14 miles southwest of Las Vegas, also is slated to resume activity. U. S. Oil and Red Rock Oil and Gas Co. is getting ready to enter the hole to set 5½-in. casing to the bottom, at 2,062 ft., and fracture the well. It was abandoned last February after pumping water.

Map shows relative location of Pennsylvanian discoveries in the Shelf-Shore areas of Eddy and Lea counties. On the left, south of Artesia, is Standard Oil Co. of Texas 1 Everest which produced 22,000 M.c.f. of gas and 276 bbl. of condensate from the Atoka at 9,085-9,116 ft. Upper right, in Lea County, near the new Seaman and Kemnitz fields, is Neville G. Penrose 1 State. Pontential was 244 bbl. of oil in 6 hours from Canyon pay at 11,708-22 ft.

NEW MEXICO

SOUTHEAST NEW MEXICO

Eddy County Wildcat Has Thick Pay Section

An Eddy County wildcat on the northwestern flank of Artesia field has an indicated 150-ft. pay section in the Abo, on the basis of successful drill-stem tests. The Abo section on most New Mexico charts is equivalent to Wolfcamp, or upper Wolfcamp.

Pan American Petroleum Corp. 1-A Malco, NE NW 11-18s-27e, made its initial heavy flow of oil on test at 5,980-6,050 ft. Oil surfaced in 28 minutes, and gaged 292 bbl. in 13 hours and 45 minutes. Flowing pressure ranged from 480-610 psi., with shut-in pressure of 2,346 psi.

A test at 6,062-6,100 ft. had oil in 10 minutes and flowed 116 bbl. in 2 hours. Gas volume had increased to 1,600 M.c.f. per day. Maximum flowing pressure was up to 1,630 psi., with approximately the same shut-in pressure reading.

A test from 6,110-50 ft. had oil in 8 minutes, and gaged 126 bbl. in 2 hours. A full string of oil was reversed out, with no water. Flowing pressure reached 1,780 psi.

Operator hit water table while testing at 6,165-6,200 ft. Recovery was 4,140 ft. of sulfur water, with no shows. Drilling continued.

No. 1-A Malco is 1 mile from Wolfcamp production in Empire field, but about 48 miles west of pay identified as the Abo, in Lovington field in central Lea County.

Lea County Deep Test Flows Permian Oil

Union Oil Co. of California 1-35 South Vacuum Unit, a 12,500-ft. exploration in central Lea County, made a good flow of oil while drill-stem testing a section identified as the lower Leonard.

On test at 8,845-9,884 ft., open 6 hours, gas surfaced in 11 minutes and oil in 53. Through ¼-in. choke, the flow gaged 30 bbl. of 33.6°-gravity oil in 4 hours. The drill pipe netted an additional 44 bbl. of oil. Flowing pressure was 1,400 psi. Shut-in pressure in 30 minutes was 2,140 psi.

Location is in 35-18s-35e.

OKLAHOMA

Texas County Wildcat To Test Mississippian

Warren-Bradshaw Exploration Co. and Max Pray are starting a significant wildcat test in southwestern Texas County, in the Panhandle. The test, 1 Rutledge, in the SW SW 9-2n-10eCM, is set up to go to the Mississippian about 5,800 ft.

Location is on a 1,920-acre block, surrounded by acreage owned by Phillips Petroleum Co. and United Producing Co. It is 7½ miles northeast of The Texas Co.'s recently completed Youtsler discovery well in 23-1n-9eCM, in the southeastern corner of Cimarron County.

Sinclair Testing No. 2 Susie

Sinclair Oil & Gas Co. has started tests of the Bromide at its 2 Susie, SE SE 1-6n-13w, southeast of its dis-

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covery of Northeast Alden field in Caddo County.

Top of the Bromide was 8,683 ft. First test at 8,704-59 ft. had gas in 10 minutes and 1-hour recovery was 70 ft. of heavily gas and slightly oil-cut mud. At 8,762-8,807 ft., gas volume was at the rate of 98,000 cu. ft. daily at the start, decreasing in volume at the end of the 1-hour test. Recovery was 270 ft. of heavily oil and gas-cut mud, plus 2,055 ft. of fluid which was 75 per cent 36°-gravity oil. Drilling continued.

Sinclair and Cities Service Oil Co. 1 Susie flowed 1,186 bbl. of oil a day from pay at 8,711-8,957 ft.

Ellis County Discovery Tests Morrow Sand

Pan American Petroleum Corp. tested gas from a second set of perforations in the Morrow sand at its 1 Tune in northern Ellis County.

Perforations in the Morrow were made at one-foot intervals at 7,855, 7,862 and 7,876 ft., then washed with 1,500 gal. of acid. Gas flow after swabbing load was at the rate of 1,723 M.c.f. a day through ¼-in. choke. Flowing tubing pressure was 2,250 psi. A drill-stem test around 7,852 ft. had gas in 2 minutes at the rate of 4,100 M.c.f. per day. Recovery on the test included 30 ft. of distillate.

A 1-hour test on Chester perforations at 7,969-8,022 ft. recovered 115 ft. of slightly gas-cut mud. Total depth was 8,150 ft.

Location is 15 miles northwest of Woodward, in NW SE 35-124n-23w.

OREGON

Oregon Deep Test Fails

General Petroleum Corp. has abandoned its wildcat in the Sulphur Spring-Siuslaw area of Douglas County. Operators took the well, 1 Long Bell, to 9,004 ft. before deciding to call it quits. A protective string of 7⅝-in. casing had been set to 6,869 ft. Location is 40 miles southwest of Eugene.

TEXAS

EAST

Favorable Shows Reported at Oakwood Salt Dome

The Texas Co. 1 A. F. Settlemyre, located on the flank of Oakwood salt dome in southeastern Freestone County, reported logging 8 ft. of favorable sand near 6,000 ft. On the basis of the survey, casing was being run for production tests. Total depth was 6,556 ft.

Location is in the R. H. Heatly Survey, A-311, 3½ miles northwest of the town of Keechi in bordering Leon County.

The Texas Co. stimulated interest in oil possibilities around the flanks of East Texas' salt domes when it opened commercial oil production at Bethel dome in Anderson County. The firm currently has one test operating near Bethel dome, which is 1 A. P. Colley, in T. H. Kingsley League, A-450. Casing was being set in 1 Colley after running electrical surveys to total depth, 6,106 ft.

Lake Ferrell Field Confirmation Well Testing

Great Expectations Oil Corp. and Amerada Petroleum Corp. 1 Albert Dorgin, confirmation test to the opener of Lake Ferrell field in western Marion County, logged 5½ ft. of oil shows in limestone at 7,380-85½ ft. and was perforating to test.

After coring the above section, drill-stem test in the Pettet from 7,364-7,406 ft. recovered 1,390 ft. of clean oil and 270 ft. of heavily

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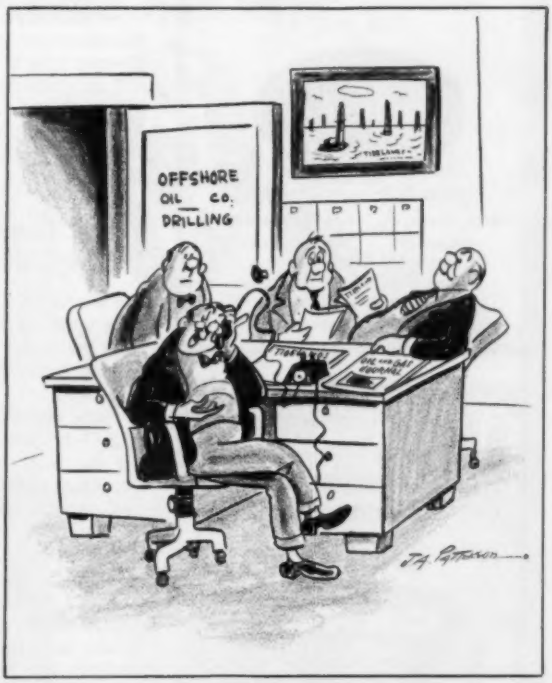

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mud-cut oil. Bottom-hole flowing pressure was 170-360 psi., and shut-in pressure was 3,160 psi.

No. 1 Dorgin is a semi-wildcat or extension test. Location is approximately ½ mile northeast of the same operators' 1 Issie Segal, discovery well of Lake Ferrell field, which completed in August for 541 bbl. of 41-gravity oil a day from Pettet at 7,333-45 ft.

WEST TEXAS

Martin County Well Devonian Prospect

Husky Oil Co. and Pan Tech Exploration Co. 1 Breedlove (formerly 1 J. E. Mabee), has recovered oil on two drill-stem tests and at last report had cored additional pay.

Initial test in the Devonian was from 11,870-12 000 ft. Recovery was 1,060 ft. of clean oil, plus 120 ft. of heavily oil and gas-cut mud.

On test at 11,867-12,017 ft., recovery was 2,000 ft. of water blanket which was cut with oil and gas, 120 ft. of oil and gas-cut mud and 6,325 ft. of clean oil with no water. Flowing pressure on this test varied from 1,040-3,130 psi., and 1-hour shut-in pressure reached 5,285 psi.

Operators then cored ahead to 12,047 ft., recovering 31 ft. of vuggy dolomite with good porosity and bleeding oil.

Wolfcamp production also has been indicated in 1 Breedlove. A drill-stem test at 10,090-10,200 ft. recovered 220 ft. of 37-gravity oil and 200 ft. of heavily oil-cut mud.

Location is 17 miles northwest of Lenorah and 1⅜-mile northwest of Devonian production in the Breedlove field.

Texas' Deepest Hole Drilling Ahead

Pan American Petroleum Corp. has filed application for still another contract depth for its 1 University "CS", central Pecos County wildcat, which will carry it to 22,000 ft.

Early last week the well was below 21,663 ft., which is the deepest mark for the state. Location is in Section 27, Block 23, University Lands Survey, or 13 miles southeast of Fort Stockton.

Pan American I University "EE", also in the Sheffield channel area of Pecos County, was drilling below 19,128 ft. It is one of the few tests in this area to reach the Ellenburger, finding that formation at 16,708 ft.

Location of 1 "EE" University is in Section 7, Block 24, University Survey. It is 6½ miles northwest of the record depth holder, and about 16 miles northwest of Puckett field, nearest production.

Central Hockley County Pennsylvanian prospect. Felmont Oil Corp. 1 Phillips, southeast of Levelland, flowed 31 bbl. of oil in 1 hour on drill-stem test at 10,122-44 ft.

In northern Pecos County Texas Crude Oil Co. 1-11 Gulf-University, a gas-distillate discovery prospect in the Wolfcamp, flowed an estimated 3,500 M.c.f. of gas, plus 10.8 bbl. of fluid in 24 hours. Fluid was said to be 95 per cent distillate and 5 per cent water.

The flow was through 20/64-in. top and 26/64-in. bottom chokes, on perforations at 4,740-4,880 ft. Location is in Section 11, Block 20, University Lands Survey. The well was shut in following the above test.

Rank Edwards Wildcat Flows Ellenburger Gas

Northeastern Edwards County had prospects of an Ellenburger gas discovery at Plymouth Oil Co. 1 Joe Sid Peterson.

A 16-hour test from 4,097-4,175 ft. gaged gas at the rate of 839,701 cu. ft. per day through ½-in. choke. On ⅜-in. choke it gaged 626/754 cu. ft. per day, and at the rate of 402,182 ft. on ¼-in. choke. Flowing pressures were not reported. Top of the Ellenburger was 4 098 ft.

Location is in the NE NE Section 81, Block E, HE&WT Survey, 14 miles northeast of Rock Springs.

TEXAS PANHANDLE

Tests Under Way at Dallam County Prospect

Rip C. Underwood 1 Moon, Cisco gas discovery in northeastern Dallam County, had increased the flow of gas from 500,000 cu. ft. to 7,000,000 cu. ft. by acid treatment and was waiting on potential test at this report.

Initial perforations in the Cisco at

3,540 ft. flowed 517,000 cu. ft. of gas a day. Additional shots at 3,525, 3,502 and 3,472 ft. gave no increase, but shots at 3,457 ft. plus at 10,000-gal. acid treatment resulted in the 7,000,000-cu. ft. flow.

Location of 1 Moon is 6 miles south of Kerrick, in Section 87, Block 1-T, T&NO Survey. The same operators have made location for a second exploratory test, approximately 2 miles northwest of 1 Moon. This will be 1 Belo, in Section 18, Block 1, I&GN Survey. Projected depth is 4,000 ft.

Ochiltree County Opener Flows Des Moines Oil

Horizon Oil & Gas Co., Amarillo, has completed its 1-57 Mary B. Weicker in west central Ochiltree County as a Des Moines discovery.

Final potential was 140 bbl. of oil a day, flowing through 24/64-in. choke, under tubing pressure which declined from 400 psi. to zero at the end of the test. Perforations were at 6,556-76 ft. Total depth was 8,198 ft.

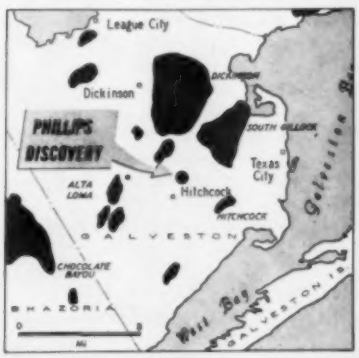
Location is in Section 57, Block 4, GH&H Survey. The new well is 3 miles northwest of Farnsworth (Upper Morrow) field.

Horizon Oil, continued testing at 1 Hoghland, Morrow sand prospect in northwestern Ochiltree County, 12 miles northwest of Farnsworth. Perforations at 7,268-78 ft. and acidized, flowed at the rate of 3,750 M.c.f. of gas a day through 1-in. choke.

GULF COAST

Galveston Gas Discovery Gets Large Flow Rating

Phillips Petroleum Co. reports the final gage of another in a series of deep discovery wells completed in the Alta Loma-Hitchcock area of Galveston County the past year.



LOCATION of deep discovery well completed by Phillips Petroleum Co. northeast of Hitchcock, in Galveston County.

The latest discovery well is its 1 Thompson, in S. F. Austin Survey, A-4, 2 miles northeast of Hitchcock, and about 4 miles east of Alta Loma.

Absolute open-flow potential of the well is placed at 77,000,000 cu. ft. of gas per day, yielding 52.4°-gravity condensate in the ratio of 10,000 cu. ft. of gas per barrel of liquid. Shut-in pressure registers 4,410 psi.

Flow rates on actual gage ranged from 2,049,000 cu. ft. per barrel through 5/32-in. choke to 5,393,000 cu. ft. per barrel through ¼-in. choke.

The well is completed in an upper Frio sand perforated at 9,090-9,110 ft. in hole drilled to 11,507 ft.

Location is about 2½ miles southwest of the large South Gillock field.

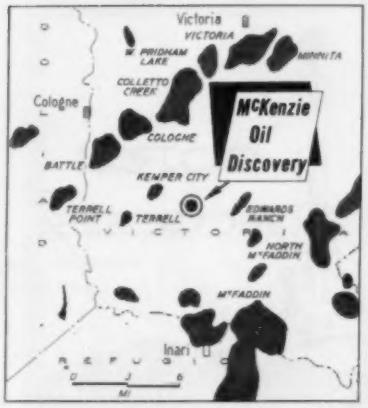
Victoria Discovery Opens New Frio Oil Production

Completion of a new oil-discovery well is reported in southwestern Victoria County.

The discovery is by McKenzie Drilling Co. at its 1 Henry Huber, in the Leonardo Rodriguez Survey, about 12 miles southwest of Victoria.

Discovery well is rated good for 154 bbl. of 22.5°-gravity oil per day, flowing through 7/32-in. choke under pressure of 150 psi. Gas-oil ratio is 600 cu. ft. per barrel. Its Frio pay is perforated at 5,351-54 ft. Hole was drilled to 6,007 ft.

Nearest production is gas, in the Kemper City Marginulina field, about 2 miles northwest, and the Edwards Ranch area, about the same distance southeast.



HERE IS portion of southwestern Victoria County showing location (indicated) of McKenzie Drilling Co.'s new oil-discovery well.

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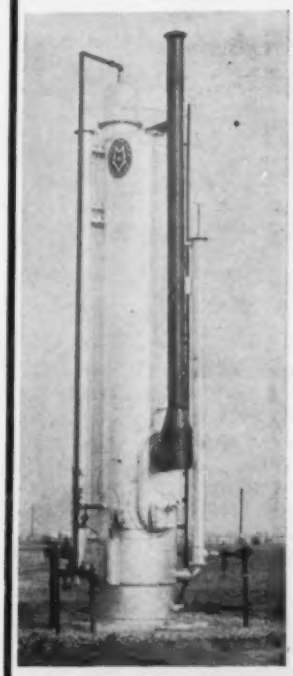

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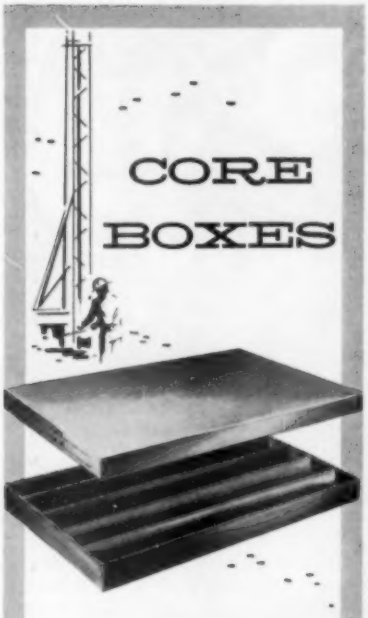

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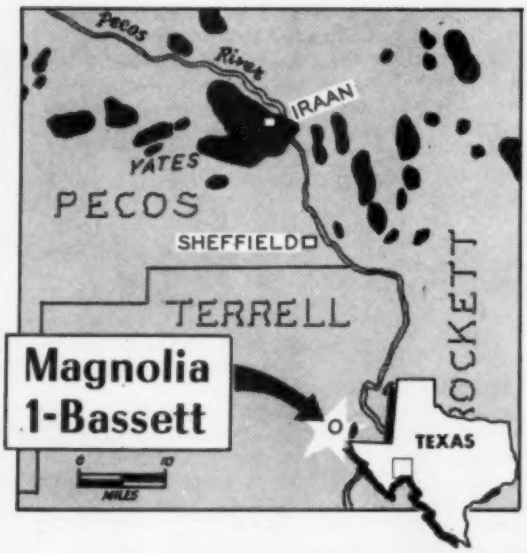

Magnolia's 1 Bassett prepared to run a third DST in the Ellenburger, at 14,308-402 ft., after flowing gas on two previous tests.

Remote Terrell County Wildcat Flows Ellenburger Gas

Magnolia Petroleum Co. 1 Brown Bassett, northeastern Terrell County wildcat which had a gas blowout in the Silurian, has made a good flow of gas from the Ellenburger.

Drill-stem test at 14,125-93 ft. had gas and mud at the surface in 10 minutes. It blew into pits for 30 minutes, then flowed dry gas for 1 hour and 20 minutes at the rate of 9,500 M.c.f. of gas a day, through 12/64-in. choke. Surface flowing pressure ranged from 850-1,650 psi., and bottom-hole flowing pressure reached a maximum of 4,110 psi. Shut-in pressure was 6,375 psi. in 30 minutes. Another drill-stem was scheduled.

The well first attracted attention when it blew out, in July, at 12,407 ft. in the Silurian. Gas volume was estimated from 25-50,000 M.c.f., plus a spray of distillate.

Formation markers released were: Strawn limestone 11,435 ft., Mississippian 11,540 ft. Woodford 11,584 ft., Devonian 11,920 ft., Simpson 12,562 ft., and Ellenburger 13,742 ft. Projected depth is 15,000 ft.

Location of the well is in the SE NW Section 218, Block Y, TCRR Survey, 39½ miles northeast of Sanderson. Magnolia and Western Natural Gas Co. hold a block of 38,000 acres around the well.

Standard Oil Co. of Texas 1 Hokit "2," eastern Pecos County wildcat, which geologically is in the north central portion of the Sheffield channel, has been completed as a flowing Pennsylvanian discovery.

Final potential after many weeks of testing, was 240 bbl. of 47°-gravity oil a day through ½-in. choke. Perforations were between 9,428-46 ft. Gas-oil ratio was 9,400:1. Tubing pressure was 400 psi. Operators had drilled to 11,506 ft., then plugged back to 10,889 ft.

Location is SE NE Section 7, Block 127, T&STL Survey. Nearest production is the big Puckett gas field about 10 miles to the southwest.

SOUTHWEST

Cano Mexico is the name of the new gas-condensate field opened by Bettis & Shepherd 6 miles southwest of Weslaco, in the southwest corner of Hidalgo County.

Its discovery well, 1 Alex Ramey, in Llano Grande Grant, Las Benitos Banco 37, is about 1½ miles southeast of another gas-condensate discovery well completed last April by Geochemical Surveys.

Calculated open-flow potential is 4,000,000 cu. ft. of gas daily, with liquid recovery of 1 bbl. to 141,400 cu. ft. of gas. Shut-in pressure is 3,610 psi. Gravity of the liquid is 54.1°. Tested through 7/32-in. choke, the well flowed 2,630,000 cu. ft. of gas daily with pressure of 2,151 psi.

The well's Frio pay is perforated at 7,628-36 ft. Hole was drilled to

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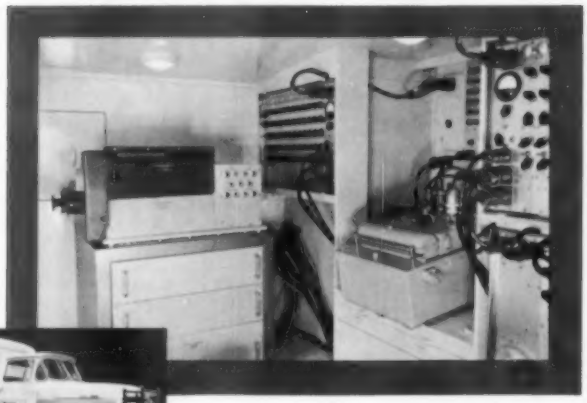

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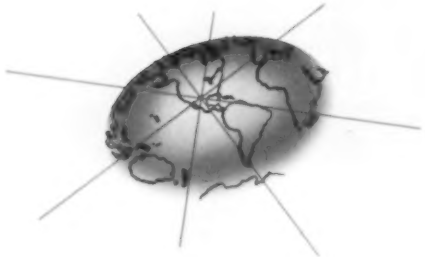

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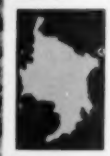

COLOMBIA

Color photographs
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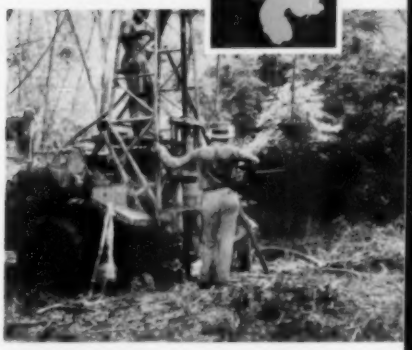
VENEZUELA



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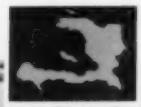

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Successful Wildcats

CALIFORNIA

Kern County: Superior Oil Co. 85-10 Kern County Land, NE SE 10-32s-26e, IP 201 BOPD, 7/8-in., 56.1° perfs. 10,021-50 ft. TD 10,415 ft. (New condensate pool discovery ¾-mile south of Paloma field.)

Universal Consolidated Oil Co. 14-19 State-K.C.L., SW NW 19-30s-27e, IP 201 BOPD, 5/32-in. 34°, perfs. 9,620-9,773 ft. TD 9,982 ft. (New Stevens sand, Miocene, pool ½-mile east of East Gosford field.)

Ventura County: The Texas Co. 1 Norman Richardson Heirs, SE SW 14-3n-21w, IPP 22 BOPD and 230 BWPD, 29°, perfs. 11,000-05 and 11,109-12,280 ft., TD 13,412 ft., PB 12,280 ft. (Deeper pool discovery ¼-mile south of Bridge area, South Mountain field).

SOUTH LOUISIANA

Allen Parish: Thomas Jordon, Inc., 1-A Industrial, 29-6s-6w. IP 90 BOPD, 3/32-in., 37°, GOR 385 cu. ft. per bbl., TP 720 psi., perforations 6,227-35 ft. TD 7,875 ft. (New field—2 miles west of Southwest Bunchy Creek field and 2½ miles east of Northeast Reeves field.)

Calcasieu Parish: Sohio Petroleum Co. and General Crude Oil Co. 1 Sweet Lake Unit 1, 30-10s-6w. IP 1,750 M.c.f. daily, 5/32-in., GLR 35 M.c.f. per bbl., 55.1°, TP 2,250 psi., perforations 10,508-12 ft. TD 11,038 ft. (New pay in Bell City field.)

Lafourche Parish: Mississippi River Fuel Co. and California Co. 3 L. L. & E., 41-19s-22e. IP 2,281 M.c.f. daily and 84 BOPD, 7/8-in., 47.5°, TP 3,600 psi., perforations 12,016-44 ft. TD 13,725 ft. (New pay and extension Bayou Raphael field.)

St. Charles Parish: California Co. 2 Timken, 36-14s-22e. IP 123 BOPD, 7/64-in., GOR 781 cu. ft. per bbl., TP 1,250 psi., perforations 7,923-44 ft. TD 12,500 ft. (Second well, new pay and oil discovery in Couba Island field.)

St. Laundry Parish: Sohio Petroleum Co. 1 Fontenot Unit 2, 30-5s-5e. IP 86 BOPD and 655 M.c.f. daily, 7/64-in., 46°, TP 2,705 psi., perforations 10,034-37 ft. TD 10,315 ft. (New pay and second well in South Washington field.)

LOUISIANA OFFSHORE

Cameron Parish: Natural Gas & Oil Co. 2 OCS-086 (State Lease 1172), Block 9, East Cameron area, Gulf of Mexico. IP 116 BOPD and 2,450 M.c.f. daily, 5/32-in. 43.9°, TP 4,500 psi., perforations 12,804-24 ft., and (dual completion) 112 BOPD and 2,350 M.c.f. daily, 7/32-in., 45°, TP 3,725 psi., perforations 12,492-12,532 ft. TD 13,392 ft. (New pays in East Cameron Block 9 field.)

Vermilion Parish: Union Oil Co. of California 2-A OCS-0559, Block 67, Vermilion area, Gulf of Mexico. IP 3,875 M.c.f. daily, ¾-in., TP 7,664-72 ft. TD 7,777 ft. (New pay in Vermilion Block 67 field.)

SOUTHEAST NEW MEXICO

Eddy County: Standard Oil Co. of Texas 1 J. H. Everest, NW SW 14-18s-26e, 5 miles SE Artesia. IP 21,000 M.c.f. gas, plus 276 bbl. 56°-gravity distillate, Atoka perfs. 9,085-9,116 ft., shut-in pressure 2,880 psi. TD 10,546 ft., PB 9,267 ft. Elev. 3,342 ft., top Atoka 8,327 ft., pay 9,078 ft., Woodford 9,900 ft., Devonian 9,916 ft., Montoya 10,368 ft.

PENNSYLVANIA

Indiana County: Columbia Carbon Co. 1845 Bethlehem-Cuba Iron Mines Co., Buffington Township. IP 4,000 M.c.f. per day after fracturing, gas, Oriskany sand 8,220-26 ft. (TD). Onondaga 8,114 ft., chert 8,218 ft.

NORTH TEXAS

Knox County: A. O. Phillips et all 2 Mrs. M. Alexander estate, 89-2-D&W Sur., 1½ mi. NE Knox City, 1 mi. S Tannehill, separated by dry holes. IPP 63 BOPD, 38-gravity, GOR 300, Tannehill 2,321-26 ft. TD 2,400 ft.

Montague County: Lloyd H. Smith and Michael Judd 1 McDonald, J. B. Miller Sur., A-460, 2 mi. NE Dyemond, 1 mi. SE 6,550-ft. production. IP 123 BOPD, 40-gravity, GOR 420, pay 6,546-51 ft. TD 7,065 ft.

Wise County: Lone Star Producing Co. 1-A Bogy, J. M. Wesson Sur., A-877, 7 mi. S Bridgeport. Conglomerate oil discovery in Roonesville field, originally completed as conglomerate gas well. IP 121 BOPD, 20/64-in., 43-gravity, GOR 1774, TP 190 psi., perforations 5,170-84 ft. TD 6,099 ft.

TEXAS PANHANDLE

Lipscomb County: The Texas Co. 1 J. A. Barton, Sec. 525, Blk. 43, H&TC Sur., 6 mi. NW Higgins. IP 2,150 M.c.f. gas, ¼-in. choke, TP 1,300 psi., shut-in pressure 2,000 psi., Morrow perforations 10,440-713 ft. TD 10,925 ft., PB 10,760 ft., elev. 2,435 ft., top Morrow 9,650 ft., sand 10,108 ft.

Roberts County: Parker Petroleum Co., Inc. 1-A Ben Hill, Sec. 146, Blk. 42, H&TC Sur., 10 mi. NW Canadian. Dual gas discovery. IP, calculated open flow, 7,600 M.c.f. plus 3 bbl. condensate per 1,000 M.c.f., 53-gravity, GOR 316,500:1, Upper Morrow 9,832-51 ft. IP, calculated open flow, 23,000 M.c.f., plus 79 bbl. condensate per 1,000 M.c.f., 56-gravity, GOR 12,670:1, Lower Morrow 10,906-28 ft. TD 11,247 ft., elev. 2,487 ft.

SOUTHWEST TEXAS

Atascosa County: Dan J. Harrison, Jr., 1 Tom, E. O'Boyle Sur., A-10 (3 miles southeast of Campbellton). IPP 25.13 BOPD (net), 79.54 per cent water, 40°, perforations 5,902-05 ft. TD 7,608 ft. (New field.)

Brooks County: Benedum-Trees Oil Co. 1 Felix de Barrera, Shares 28, Palo Blanco de Charco Redondo Grant, A-258 (13 miles west of Falfurrias). IP 2,742 M.c.f. daily, ¼-in., 11.6 BC per M.M.c.f., 69.2°, TP 1,787 psi., perforations 5,643-61 ft., and (dual completion) 3,020 M.c.f. daily, ¼-in., 20.4 BC per M.M.c.f., 65.7°. TP 1,985 psi., perforations 5,916-34 ft. TD 6,205 ft. (New field—1½ miles north of Mills Bennett field.)

Frio County: Joe Bailey Oil Co. 1 Harrington, Section 176, Peter Macle Sur., A-506 (7 miles southwest of Big Foot.) IP 50.12 BOPD, ⅛-in., 38°, GOR 200 cu. ft. per bbl. TP 140 psi., perforations 3,631-38 ft. (Olmos). TD 3,648 ft. (New field—1½ miles northeast of Touchstone field.)

Jim Hogg County: La Gloria Oil & Gas Co. 1 McCampbell, Las Vivoritas Grant, A-226 (1 miles south of Hebbronville). IPP 29.06 BOPD (net), 18 per cent water, 46.5°, perforations 4,772-76 ft. and 4,782-4,807 ft. (Pettus). TD 6,050 ft. (New field.)

TEXAS GULF COAST

Goliad County: Tennessee Gas Transmission Co. 1 Bomba, Peter Gass Sur., A-129. Shut-in gas-condensate well (tested gas with 57 BC per M.c.f., ⅛-in., TP 1,500 psi.), perforations 8,383-90 ft. (Wilcox). TD 8,515 ft. (New field—2½ miles northeast of Weser.)

Galveston County: Phillips Petroleum Co. 1 Thompson Trustee, S. F. Austin Sur., A-4 (2 miles northeast of Hitchcock). IP 77,000 M.c.f daily, absolute open-flow potential, GLR 10 M.c.f. per bbl., 52.4°, shut-in pressure 4,410 psi., perforations 9,090-9,100 ft. (upper Frio). TD 11,507 ft. (New field.)

Harris County: Humble Oil & Refining Co. 1 Second National, Dickerson Putnam Sur., A-638 (2½ miles south of Genoa). IP 16,000 M.c.f. daily, absolute open-flow potential, dry gas, shut-in pressure 1,738 psi., perforations 4,166-76 ft. (Miocene). TD 15,461 ft. (New field—Alcott.)

Jefferson County: Meredith & Co. et al 1 Daniel, HT&B Sur. 13, A-147 (7 miles northeast of Fannett). IP 157 BOPD, ⅛-in., GOR 701 cu. ft. per bbl., 37.3°, TP 1,160 psi., perforations 7,512-17 ft. (New pay and extension in South China field.)

Tyler County: Sinclair Oil & Gas Co. and Atlantic Refining Co. 1 William Brown ree, William S. Brown Sur., A-62 (2½ miles west of Wurtsbaugh field). IP 278.76 BOPD, 5/32-in. 44.6°, GOR 1,323 cu. ft. per bbl., TP 1,300 psi., perforations 8,432-54 ft. (Wilcox). TD 10,500 ft. (New field — Theuvenins Creek.)

WEST TEXAS

Borden County: Shell Oil Co. 1 J. B. Slaughter estate, 16-30-T6N-T&P, 12 mi. N Gail. IP 189 BOPD, 40-gravity, GOR 71, TP 915 psi., Ellenburger 8,633-42 ft. TD 8,645 ft., elev. 2,636 ft.

Midland County: Rutter & Wilbanks Bros. 1 Windham, 32-40-T3S-T&P, 15 mi. S Midland. Originally drilled dry to 13,390 ft., in Ellenburger topped at 13,265 ft. On recompletion pumped 81 BOPD, 37-gravity, GOR 350, Clear Fork 7,434-45 ft.

Reagan County: Pool & Gerlich Drilling Co. 1 T. J. Owens, 210-1-T&P Sur., 12 mi. NE Big Lake. IPP 12.4 BOPD, 35 gravity, GOR 150, Grayburg 2,083-90, 2,093-98 ft., TD 2,377 ft.

WEST VIRGINIA

Tucker County: Hope Natural Gas Co. 10097 Arlie W. Myers, Licking district. IP 8,540 M.c.f. per day, rock pressure 1,960 psi. in 3 hours. TD 4,804 ft. Elev. 1,967 ft., chert 4,585 ft., gas 4,800 ft.

LEGAL

SEALED BIDS will be received until 2:00 P. M. CST November 19, 1957, and opened at that time in the Office of the Fort Berthold Indian Agency, New Town, North Dakota for the leasing of 2040.00 acres of allotted Indian land, located in Township 150 N. Rgs. 94 and 95 W., McKenzie County, North Dakota, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Fort Berthold Indian Agency at New Town, North Dakota, or call the Agency Land Office. Phone MA 74340, New Town.

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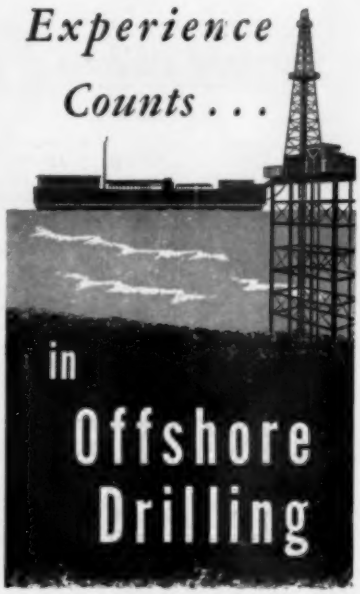

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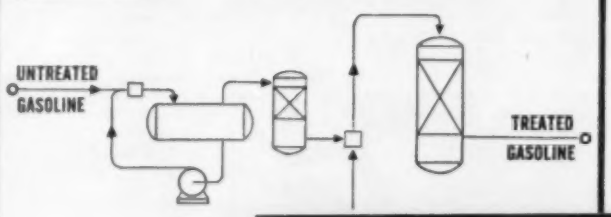

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To fight its war in Congress . . .

. . . I.P.A.A. Looks to Simpson

A SLOW-SPOKEN Texan observed his sixty-third birthday last week in Dallas by being elected president of the Independent Petroleum Association of America.

He is Gordon Simpson, president and director of General American Oil Co. of Texas.

Simpson takes over the I.P.A.A. helm just a couple of months before Congress again convenes. During the session, it is being freely predicted that the oil industry likely will be attacked more sharply than ever before on such issues as depletion, imports, antitrust, and others.

And this is one very big reason why Simpson was elected. Few would appear to be so well qualified to direct I.P.A.A.'s battles in Washington. Simpson will make his first association trip there this month after a stopover in Chicago for the big A.P.I. convention. He will take with him an unusual mixture of talent.

He has been a lawyer, politician, and judge much longer than he has been an oil man.

He began practicing law in Tyler, Tex., in 1919 on receiving his LL.B. from the University of Texas. He joined General American as general counsel in 1949 to organize it's legal department. Between those dates, he served as judge of the Second Judicial District of Texas, member of the Texas House of Representatives, and as justice on the Texas Supreme Court.

He was paid an unprecedented compliment when elected to the Supreme Court in January 1945 while he was in Italy with the military.

During the war he served as a lieutenant colonel in the Judge Advocate General's Department, U. S. Army. And in 1948 he was named chairman of an Army commission assigned to investigate the Malmedy and other war crimes cases tried at Dachau, Germany. He still holds the rank of colonel in the reserves.

The switchover . . . Since he resigned as justice on the Texas Supreme Court to join General American, his job has gradually evolved into that of an operating oil man.

He was named a vice president shortly after joining the firm, executive vice president in 1952, and president in 1954.

It is Simpson who has served as ramrod and chief negotiator in General American's overseas ventures during the past 5 years. He parlayed patience and persistence into reasonable, workable concession agreements in Spain and Egypt—areas written off by the world oil industry generally as having impossible political climates.

GORDON SIMPSON
. . . a man of many talents.

The company currently is exploring Spain in partnership with the Spanish Government and other U. S. oil interests.

Formal Egyptian approval of an agreement giving General American a large concession in Northeast Egypt east of the Nile River was expected momentarily last fall but was stalled by the Suez Canal crisis.

Simpson says the company may take up where it left off when the situation in Egypt stabilizes.

For import controls . . . Despite the fact that his company may some day have some foreign oil to market, Simpson is a strong advocate of import controls.

He has been somewhat skeptical about a voluntary program, initially favoring a compulsory quota system. The voluntary system is fine with him, however, if it works.

So far as gas is concerned, Simpson thinks the gas producer's present situation untenable.

"It just isn't possible," he says, "for the agency to regulate gas producers' prices and operations in the way FPC has been told it must do it."

It is apparent that the new I.P.A.A. president is ready to do battle next year to help remedy such ills. (See related I.P.A.A. news, pages 82-87.)

Three officers reelected . . . Russell B. Brown, I.P.A.A. general counsel, was reelected as were W. L. Kistler, Jr., Tulsa, treasurer; and I. C. Huff, Jr., Tulsa, executive manager and secretary.

Nine new executive committeemen were chosen by the association. They are John R. Lavens, Jr., Evansville, Ind.; Richard G. Lawton, Magnolia, Ark.; Richard T. Lyons, Houston; H. M. McClure, Jr., Alma, Mich.; Fred W. Shield, San Antonio, Tex.; W. E. Shrider, Hebron, Ohio; C. H. Todd, Wichita; and Clyde J. Tomlinson, Longview, Tex. W. M. Vaughey, Jackson Miss., retiring chairman of the executive committee, also was elected to serve as a member.

Newly elected vice presidents include Don D. Montgomery, Montgomery Drilling Co., vice president for Arkansas; R. F. Ramsey, Barbara Oil Co., Kansas; Frank J. Zogg, Zogg Oil Co., Kentucky; E. Allan Morrow, Leonard Refineries, Inc., Michigan; R. J. Connors, W. C. McBride, Inc., Missouri; Patrick J. McDonough, Western Oil Well Service Co., Montana; Hugh E. Palmer, Cardinal Drilling Co., North-South Dakota; Curtis Hankamer, Houston, Southwest Texas; J. Ed Connally, West Central Texas; and Paul Neuenschwander, Wiser Oil Co., West Virginia.

James W. Knowles, formerly with Ebasco Services as chief inspector on pipeline construction projects, has joined Alberta Gas Trunk Line Co., Ltd., as district pipeline superintendent at Oyen, Alta.

Paul E. Hall, formerly with Wyatt C. Hedrick Engineering Corp., Houston, has joined Goliad Corp. He is project manager for construction of a gas-gathering system in Pembina field, with headquarters at Calgary. After the project is completed he will be assigned to Houston.

Frank C. Somers, section head in Esso Research & Engineering Co.'s construction engineering division, has been named assistant manager of the company's new office in The Hague, Netherlands. Somers joined Esso in 1939. He left the company to join Atlantic Refining Co. in 1953, returning to Esso early this year. In other Esso Research appointments, **Robert F. Leary,** section head in chemicals research, has been promoted to assistant director of the chemicals research division. **Dr. Neil F. Baumgartner** has been named section head in chemicals research, and **Ralph A. Cardello,** section head in planning engineering.

Sunray Opens Canadian Exploration Office

Karl Martin, second from left, will head the new Calgary office of Sunray Oil Co. of Oklahoma, subsidiary of Sunray Mid-Continent Oil Co. Martin's title will be Canadian division exploration manager. He has been Rocky Mountain division landman since 1956. Also assigned to the new division are Paul Bauman, left, formerly geologist in Casper, Wyo., transferred to Calgary in the same capacity; Coleman Fite, standing, geologist; and Fred Phelps, right, formerly research geologist, who has been named division chief geologist.

Leland F. Johnson, president of Pennzoil Co. of California, has been elected a director of South Penn Oil Co. A graduate of Stanford University, Johnson joined Pennzoil, a South Penn affiliate, in 1932. On the South Penn board he succeeds the late Henry Suhr.

W. H. Drushel has moved up from eastern district superintendent in The Texas Co.'s South Texas division to assistant general superintendent of drilling and production in this division. **John M. Wilson,** who has been on loan as manager of technical services for the Iranian consortium since 1955, will succeed Drushel as district superintendent in the South Texas division. Both Drushel and Wilson joined Texaco in 1935. Drushel had held his district superintendent post since 1947. Wilson was district superintendent for the company in El Campo, Tex., before his foreign assignment.

T. D. Barber, Pan American Petroleum Corp.'s Texas-Louisiana Gulf Coast division geologist, has been appointed assistant division exploration superintendent. **W. B. Rodan,** assistant division geologist, will succeed Barber. Both will headquarter in Houston. In Pan Am's Lafayette, La., district, **R. L. Blanton** has been promoted to district geologist. He replaces **J. C. Meeker,** who was recently transferred to the company's Canadian division as division geologist.

James F. Allen has been appointed manager of American Cyanamid Co.'s refinery chemicals department, industrial chemicals division. He was formerly assistant manager of the department.

F. G. Brooks, foreman gager for Pasotex Pipe Line Co. in Baytown, Tex., has been transferred to Standard Pipe Line Co., an affiliate, as terminal foreman in El Paso, Tex.

H. G. Pegues has been promoted by United Gas Pipe Line Co. from superintendent of dispatching and communications to superintendent of pipeline operations. **C. W. Evans** will succeed Pegues in dispatching and communications.

R. W. Mallory, Champlin Oil & Refining Co.'s district manager at Casper, Wyo., has been transferred to Calgary as manager of the Canadian division. **W. L. Hershelman,** district manager in Denver, has moved to Casper to replace Mallory. Hershelman will be succeeded by **L. J. Sebring,** Lafayette, La., area geologist. In other changes in its land and exploration department, Champlin has transferred **M. B. Hansen,** district manager in Lafayette, to Fort Worth as evaluation geologist, a new position. Hansen will evaluate territory, such as the company's concession in Panama, which is not covered by a district office. **Clint St. Clair,** landman in Lafayette, has been transferred to Calgary in the same capacity.

Personals

Wilbur L. Durr, geologist, has been transferred to Magnolia, Ark., from Canton, Miss., by Continental Oil Co.

Richard B. Banks has joined Pan American Petroleum Corp. in Odessa, Tex., as junior petroleum engineer.

Robert L. Knox, trainee with Sohio Petroleum Co. in Oklahoma City, has been named junior production engineer in Russell, Kans.

Vincent P. Sweeney, Jr., has joined Sinclair Oil & Gas Co. as petroleum engineer in Denver. He was formerly with Ohio Oil Co. in the same capacity.

J. W. Wilson has moved up from assistant southern regional geophysicist for Continental Oil Co. in Houston, to central regional geophysicist with headquarters in Oklahoma City. He succeeds **E. L. Mount,** who was recently named superintendent of the geophysical section's operations division in Ponca City, Okla. Wilson has been with Conoco since 1944.

L. B. DERBY

L. B. Derby, assistant general manager of The Texas Co.'s foreign operations department (Western Hemisphere and West Africa), has moved up to general manager of the department. He succeeds **A. W. Baucum,** whose appointment as general manager of the foreign producing department (Western Hemisphere and West Africa) was announced last week. Derby has been with Texaco since 1927. He held foreign assignments in Haiti, Puerto Rico, Mexico, Uruguay, and Argentina before transferring to New York in 1951. He has been assistant general manager of foreign operations departments since April.

U. S. Grant IV, professor in the geology department of University of California at Los Angeles, has been elected president of the Pacific section of American Association of Petroleum Geologists. Other officers are **Thomas A. Baldwin,** senior geologist for Monterey Oil Co., vice president; **George Y. Wheatley,** district geologist with Superior Oil Co., secretary; and **Robert R. Knapp,** geologist with Standard Oil Co. of California, treasurer.

Personals

A. J. Galloway has been elected an executive vice president of Shell Oil Co. He will continue to be in charge of Shell's exploration and production activities, a position he has held since 1948. Galloway joined Shell as a geologist in 1926. He was exploration and production vice president for the Mid-Continent and later for the Texas Gulf Coast area and territory east of the Rockies before becoming vice president in charge of all exploration and production. He has been a director of the company since 1953.

Frank F. Painter, former Tulsa independent, has joined Petroleo Brasileiro, S.A., (Petrobras), Brazilian Government oil agency, as geologist in Sao Luiz, Brazil.

Frank Menton, staff engineer at Tidewater Oil Co.'s Delaware City, Del., refinery, has been transferred to New York as assistant in the process section, lubricants supply department.

R. C. Alden, chairman of Phillips Petroleum Co.'s research planning board, retired November 1. Alden joined Phillips in 1925 when the company's research department was being organized. He became director of research in 1933 and chairman of the research planning board in 1950. In 1937 Alden was first recipient of Natural Gasoline Association of America's Hanlon Award for service to the natural-gasoline industry.

J. G. Livingstone, manager of coordination and economics for Imperial Oil, Ltd., has been appointed assistant general manager of manufacturing. Imperial has also appointed **S. T. Reynolds,** plant superintendent at Edmonton, manager of the company's Calgary refinery. He succeeds **J. J. Hanna,** who has retired. **F. B. Doull,** process superintendent of the lubricating plant at Edmonton, moves up to succeed Reynolds as plant superintendent. Livingstone joined Imperial in 1942. He was chief process engineer, engineering division, and assistant superintendent of the Winnipeg refinery before moving into coordination and economics department in 1953. Reynolds was assistant superintendent of the Calgary refinery before moving to Edmonton in 1951. Reynolds has been with Imperial since 1935; Doull, since 1929.

Don G. Stephens, production engineer, has been transferred by Skelly Oil Co. from Oklahoma City to Pampa, Tex.

Dr. William E. Hanson has been promoted to administrative fellow on the multiple fellowship in petroleum at the Mellon Institute, Pittsburgh, following **Dr. W. A. Gruse's** retirement. **Robert G. Capell** has been advanced to associate administrative fellow.

C. T. Carter, general manager of crude lines for Sinclair Pipe Line Co., has been promoted to director of engineering. **L. C. Foy,** assistant general manager of crude lines, has moved up to replace Carter. Foy will be succeeded as assistant general manager by **W. M. Bellairs,** assistant chief engineer.

John W. Strickland, assistant division geologist for Continental Oil Co. at Casper, Wyo., has been promoted to division geologist there. He succeeds **J. C. Cooper,** who was recently transferred to Fort Worth as assistant southwestern regional geologist. **Glenn C. Hager** will replace Strickland as assistant division geologist in Casper. Hager has been serving in this capacity in Ardmore, Okla. In other appointments, **Charles A. Tallard,** assistant division geologist in Billings, Mont., has been transferred to Denver as regional staff geologist, a new position. **Robert C. Busby,** geologist in Casper, will succeed Tallard in Billings.

MILLS COX

Mills Cox, formerly vice president of Texas Eastern Transmission Corp., has been elected executive vice president of Transwestern Pipeline Co. Transwestern, which plans to build a natural-gas line from the Four Corners area to southern California, will establish headquarters in Houston. As vice president of Texas Eastern since 1950, Cox was responsible for acquisition of gas reserves, and the negotiation of the company's gas purchase contracts, including purchase of gas from Petroleos Mexicanos. The new transmission company was formed by Monterey Oil Co., Warren Petroleum Corp., and J. R. Butler, Houston consultant. **John R. McMillan,** executive vice president of Monterey, is president of Transwestern.

Page Blakemore, superintendent with Utah Southern Oil Co., has been transferred to Cameron, Ariz., from Salt Lake City.

Emery Love, petroleum and gas engineer, is making a gathering system survey in Cuban oil fields. Love retired November 1 as gas engineer for Gulf Oil Corp.'s Tulsa division after 39 years of continuous service.

DEATHS

Forest D. Dorn, chairman of the board of Forest Oil Corp., died October 24 at his home in Bradford, Pa. Dorn founded the company with his father, the late Clayton G. Dorn, in 1916. His five sons are active in its management. Dorn was a pioneer in water-flooding techniques. His company was hired by the Colombian Government last year to try to boost oil recovery in two of that country's producing fields. The company has interests in 15 states, Colombia, Canada, and Cyprus.

Joseph Lippert, 79, Denver, retired driller, nitroglycerin manufacturer, oil-well shooter, and oil-field superintendent in the Mid-Continent and Rocky Mountain areas, died October 25 in Denver after a fall on icy stairs. Lippert retired in 1933.

Verl L. Elliott, 63, Paoli, Pa., controller of Atlantic Refining Co. since 1926, died October 25. Elliott was originator of the widely used "LIFO" system of valuing inventories. He was a past chairman of the American Petroleum Institute's committee on uniform methods of oil accounting and was the first to receive an A.P.I. certification of appreciation from this group in 1951.

Ray L. Dudley, 66, president of Gulf Publishing Co., died October 29 at his home in Houston. Gulf is publisher of World Oil, Petroleum Refiner, and Pipe Line Industry. Dudley's career in oil journalism goes back to 1916. He was a past general manager and oil editor of the Houston Post and one of the founders and a past president of the Nomads.

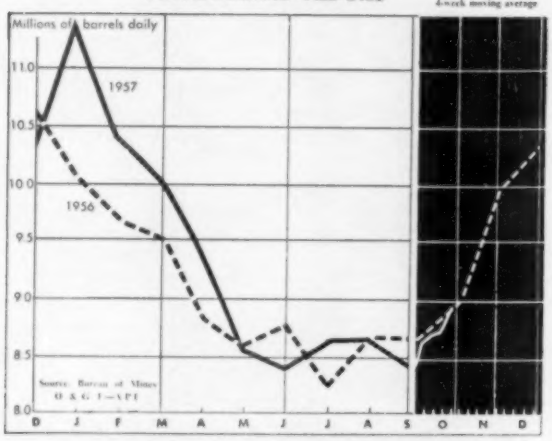
Norman M. Doherty, 57, Gulf Oil Corp. landman, died October 27 in Houston. Doherty had been with Gulf for 25 years.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,776,700	UP	36,850	DOWN	174,887
Crude stocks	284,878,000	UP	1,564,000	UP	3,321,000
Completions	1,117	UP	17	UP	76
Refinery runs	7,649,000	DOWN	212,000	DOWN	21,000
Gasoline stocks	179,288,000	UP	25,000	UP	7,303,000
Kerosine stocks	35,486,000	UP	474,000	UP	968,000
Distillate stocks	174,977,000	UP	1,192,000	UP	17,709,000
Residual stocks	59,465,000	UP	642,000	UP	11,972,000
Four-product stocks	449,216,000	UP	2,333,000	UP	37,952,000
Total imports	1,550,200	UP	11,400	UP	3,000

TOTAL DEMAND—ALL OILS



Asphalt Contributed to the Residual Problem But Is Not the Only Culprit

SOME REFINERS are blaming asphalt for the poor residual markets that are developing in most of the distribution areas of the country. It is true that consumption of asphalt and road oil was below normal in the early summer months because of the weather. Widespread rains in late spring and early summer delayed road construction and so cut the use of asphalt.

Total demand for asphalt and road oil is shown in Table 2. Note that demand was below the previous year for every month of the first half of the year. July demand represented a return to near-normal growth.

However, the total for the first 7 months of 1957 was only about 2,000,000 bbl. under the total for the same period of 1956. This loss certainly contributed to the surplus of residual fuel, but it was not the only culprit.

Table 1 shows stocks and domestic demand for heavy fuel. Demand for January 1957 was slightly larger than for the corresponding month of 1956. Also, small increases were reported for April and July. Current data indicate very little change in August and September. Demand was down in the other months.

Total domestic demand for residual through September is estimated at 406,000,000 bbl. compared with 411,500,000 bbl. for the same months last year. Domestic demand was off 5,500,000 bbl.

Increases in residual exports, particularly during the Suez crisis, have been offset for the most part by increases in imports.

It is possible that higher residual prices this year caused some customers to switch to alternate fuels.

Market reports in the Group 3 area indicate an increase in shipments to the Gulf Coast. Since this material nets the Mid-Continent refiner less than $1.50 a barrel, the trend may influence quotations on fuel for northern movement.

TABLE 1—RESIDUAL FUEL—STOCKS AND DEMAND

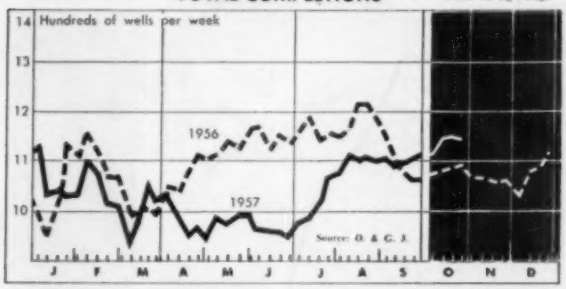
	Stocks*		Domestic demand†	
	1956	1957	1956	1957
January	38,247	38,403	1,925	1,964
February	35,673	36,201	1,876	1,804
March	32,984	37,371	1,693	1,620
April	32,740	37,429	1,549	1,573
May	36,607	41,125	1,403	1,346
June	39,073	45,572	1,330	1,260
July	43,958	49,621	1,166	1,232
August	46,617	‡52,600	1,272	‡1,280
September	47,342	‡57,900	1,315	‡1,320
October	48,400	.....	1,446	.....
November	44,590	.....	1,680	.....
December	44,491	.....	1,754	.....

*Thousands of barrels. †Thousands of barrels daily. ‡Estimated from weekly data.

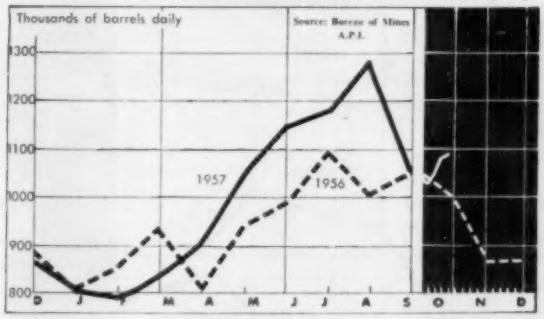
TABLE 2—TOTAL DEMAND FOR ASPHALT AND ROAD OIL

	1954	1955	1956	1957
January	86	101	117	112
February	112	119	120	115
March	124	148	159	139
April	177	199	204	196
May	254	293	300	282
June	367	394	416	378
July	378	402	440	474
August	383	442	481	.....
September	356	387	402	.....
October	275	295	343	.....
November	184	188	199	.....
December	114	121	132	.....

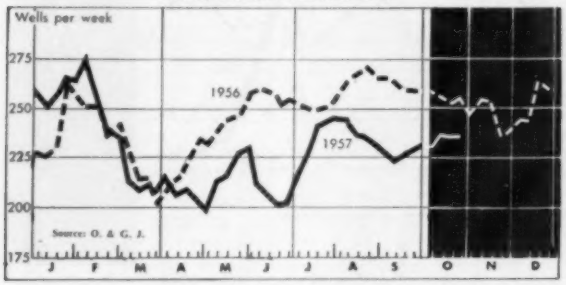
TOTAL COMPLETIONS



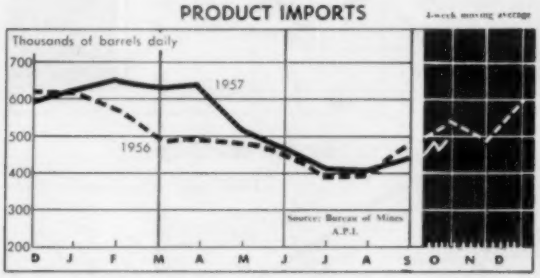
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

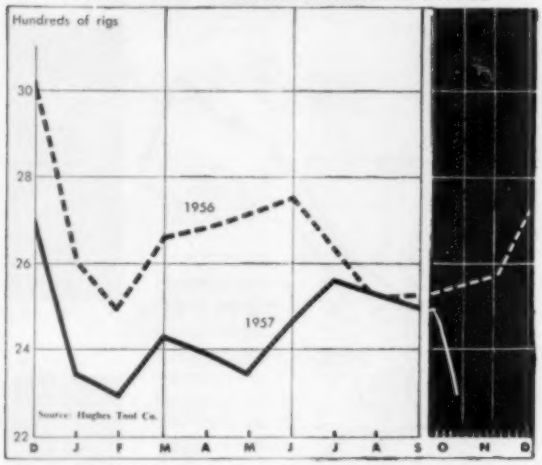


WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 26, 1957

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	0	0	0	0	0	0	0	67	‡92	0	0	0	0	0	21	‡41
Arkansas	20	11	0	1	8	0	69,030	909	765	3	0	0	0	3	169	155
California	57	45	1	0	11	0	335,546	1,815	1,816	12	2	1	0	9	437	426
Colorado	10	2	0	0	8	0	53,781	696	985	5	0	0	0	5	457	527
Illinois	77	34	0	0	43	0	185,952	2,204	3,256	14	0	0	0	14	518	630
Indiana	18	8	0	0	10	0	31,557	554	568	3	0	0	0	3	109	117
Kansas	87	43	0	4	40	0	287,730	3,467	4,110	20	0	0	0	20	696	893
Kentucky	31	4	0	4	23	0	41,648	1,239	1,563	5	0	0	0	5	249	362
Louisiana	90	45	5	10	30	0	655,014	3,175	3,156	14	2	0	2	10	565	636
North	38	20	0	4	14	0	144,105	1,172	1,395	6	2	0	0	4	160	213
South	31	11	5	0	15	0	311,748	1,435	1,425	6	0	0	0	6	333	360
Offshore	21	14	0	6	1	0	199,161	568	336	2	0	0	2	0	72	63
Michigan	21	4	0	11	6	0	60,953	362	365	5	0	0	0	5	128	143
Mississippi	13	6	1	0	6	0	95,085	320	365	3	0	0	0	3	164	177
Montana	6	0	0	0	6	0	15,611	342	380	4	0	0	0	4	136	140
Nebraska	23	5	0	0	18	0	138,384	745	797	12	0	0	0	12	409	395
New Mexico	38	18	0	10	10	0	205,626	1,780	1,571	6	2	0	0	4	232	221
Northwest	18	5	0	9	4	0	82,707	754	697	2	0	0	0	2	90	77
Southeast	20	13	0	1	6	0	122,919	1,026	874	4	2	0	0	2	142	144
New York	0	0	0	0	0	0	0	372	....	0	0	0	0	0	7	....
North Dakota	8	4	0	0	4	0	51,365	236	217	3	2	0	0	1	106	65
Ohio	31	21	0	8	0	2	78,273	927	893	3	2	0	1	0	16	12
Oklahoma	118	68	0	3	40	7	379,935	5,274	6,879	13	0	0	1	12	616	730
Pennsylvania	2	0	0	2	0	0	11,402	519	†755	2	0	0	2	0	41	†23
Texas	406	223	16	18	147	2	1,717,458	17,946	18,250	86	3	1	1	81	4,270	4,665
Dist. 1	31	19	1	1	10	0	67,130	1,024	*2,609	5	0	0	0	5	347	*905
Dist. 2	23	5	3	2	13	0	126,420	636	*2,168	12	0	1	1	10	224	*716
Dist. 3	38	13	5	1	19	0	247,822	1,400	....	14	1	0	0	13	397	....
Dist. 4	21	6	4	1	10	0	136,188	1,156	....	4	0	0	0	4	372	....
East	22	11	2	0	9	0	99,957	1,113	964	5	0	0	0	5	320	348
Dist. 7-B	46	16	0	1	28	1	166,862	2,441	....	14	0	0	0	14	830	....
West	110	87	0	2	21	0	538,840	5,069	4,865	13	1	0	0	12	721	769
Dist. 9	86	50	0	3	32	1	223,050	3,918	*6,549	17	1	0	0	16	968	*1,826
Dist. 10	29	16	1	7	5	0	111,189	1,189	1,095	2	0	0	0	2	91	101
Utah	8	6	0	0	2	0	44,863	190	100	6	0	0	0	6	97	60
West Virginia	19	2	0	16	1	0	49,357	571	567	1	0	0	1	0	28	19
Wyoming	32	16	1	0	15	0	143,377	716	724	7	0	1	0	6	246	220
Misc. (S. Dak.)	2	0	0	0	2	0	3,705	114	71	2	0	0	0	2	97	64
Total U. S.	1,117	565	24	87	430	11	4,655,652	44,530	48,245	229	13	3	8	205	9,814	10,721
Total prev. week	1,100	552	11	78	444	15	4,409,876	.....	.....	239	18	0	7	214	.....	.....
Cum. 1957	44,530	23,008	473	3,209	16,936	904	183,774,315	.....	.....	9,814	988	85	333	8,408	.....	.....
Western Canada	48	32	0	5	11	0	228,369	2,509	.....	11	1	0	2	8	708	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

ROTARY RIGS OPERATING IN UNITED STATES



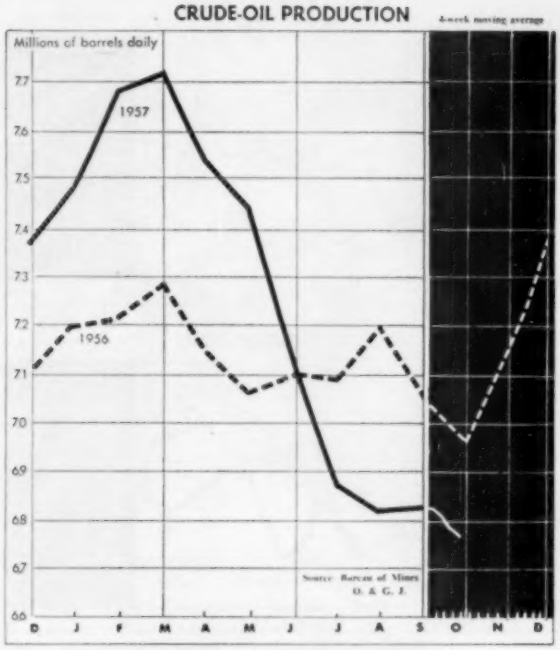
ACTIVE ROTARY RIGS*

Area—	10-28-57	10-21-57	10-14-57	10-29-56
Alabama	6	5	4	8
Arkansas	23	30	27	18
Arizona	1	1	1	....
California	84	87	90	105
Colorado	52	56	60	74
Florida	1	1	1	4
Georgia	....	....	....	....
Idaho	....	....	....	....
Illinois	50	47	63	61
Indiana	7	7	11	13
Iowa	2	2	2	1
Kansas	137	155	162	170
Kentucky	11	8	10	14
Louisiana	407	427	432	443
North	63	56	57	73
South	264	284	283	370
Offshore	80	87	92	(†)
Maryland	1	1	1	....
Michigan	13	11	11	18
Missouri	....	....	....	1
Mississippi	37	38	40	28
Montana	41	43	41	46
Nebraska	26	24	28	24
Nevada	....	....	....	....
New Mexico	136	144	139	128
New York	....	....	....	....
North Dakota	41	37	38	25
Ohio	1	1	....	1
Oklahoma	230	240	251	250
Oregon	1	1	1	2
Pennsylvania	13	13	13	6
South Dakota	1	1	1	....
Texas	839	859	876	996
Gulf Coast	159	173	178	239
Offshore	7	4	4	(‡)
West	338	350	351	381
North	294	287	283	316
East	41	45	60	60
Tennessee	....	....	1	....
Utah	54	62	66	28
Washington	1	1	1	1
West Virginia	3	3	3	3
Wyoming	78	78	78	69
Virginia	....	....	....	....
Total United States	2,297	2,383	2,452	2,537
Western Canada	179	181	165	234
Eastern Canada	3	3	3	....
Grand total	2,479	2,567	2,620	2,771

*Hughes Tool Co. †Included with South Louisiana. ‡Included with Texas Gulf Coast.

CRUDE-OIL PRODUCTION

4-week moving average

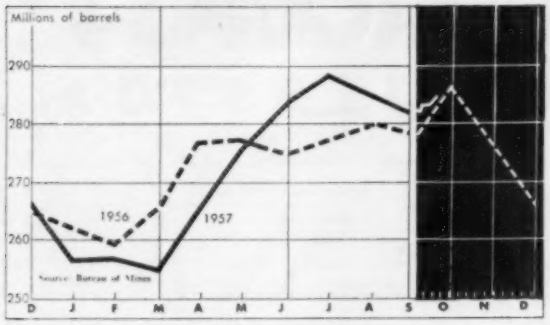


DAILY AVERAGE PRODUCTION FOR WEEK

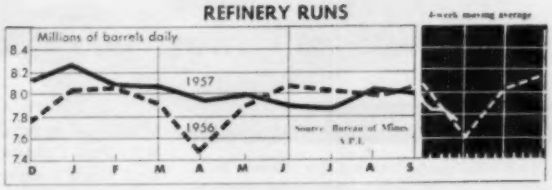
	October 26, 1957			Oct. 19
	Crude oil	Lease condensate	Total	total
Alabama	16,950	.....	16,950	17,000
Arkansas	79,900	200	80,100	81,350
California	934,800	.....	934,800	933,700
Colorado	145,800	.....	145,800	143,400
Eastern	53,200	.....	53,200	54,000
Florida	1,250	.....	1,250	1,250
Illinois	232,000	.....	232,000	232,400
Indiana	37,200	.....	37,200	36,100
Kansas	†354,600	.....	†354,600	†328,000
Kentucky	43,400	.....	43,400	44,100
Louisiana	725,500	77,600	803,100	802,900
North	110,500	2,600	113,100	112,900
South	615,000	75,000	690,000	690,000
Michigan	26,900	.....	26,900	26,800
Mississippi	99,800	4,500	104,300	104,300
Montana	75,000	.....	75,000	74,850
Nebraska	54,550	.....	54,550	55,200
Nevada	150	.....	150	150
New Mexico	249,000	4,300	253,300	253,300
North Dakota	29,350	.....	29,350	24,350
Oklahoma	†562,100	.....	†562,100	†569,500
Texas	2,595,000	55,100	2,650,100	2,650,100
Dist. 1	48,000	500	48,500	48,500
Dist. 2	116,000	8,800	124,800	124,800
Dist. 3	374,000	26,800	400,800	400,800
Dist. 4	197,000	6,300	203,300	203,300
Dist. 5	32,000	300	32,300	32,300
Dist. 6	108,000	5,900	113,900	113,900
East Texas Field	155,000	.....	155,000	155,000
Dist. 7-B	143,000	75	143,075	143,075
Dist. 7-C	138,000	3,875	141,875	141,875
Dist. 8	982,000	1,400	983,400	983,400
Dist. 9	200,000	600	200,600	200,600
Dist. 10	102,000	550	102,550	102,550
Utah	12,600	.....	12,600	11,300
Wyoming	305,750	.....	305,750	295,600
Others	‡200	.....	‡200	‡200
Total U. S.	6,635,000	141,700	6,776,700	6,739,850
Change from prev. week, up			36,850	
Canada	†464,000	.....	†464,000	†477,200
Total U. S. production—January 1-October 26				2,161,408,450 bbl.
Same period last year (crude plus cond.)				*2,139,220,515 bbl.

*Includes 36,765,480 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

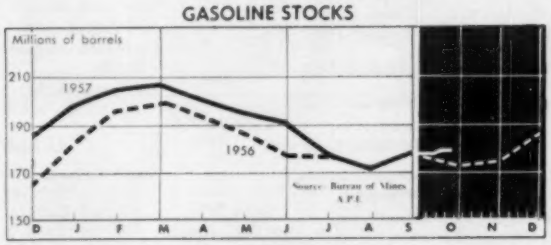
CRUDE-OIL STOCKS



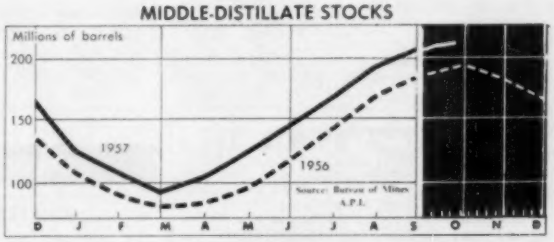
REFINERY RUNS



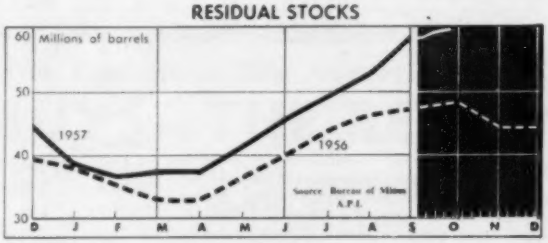
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	10-19-57	10-12-57	10-20-56
Pennsylvania Grade	3,131	3,084	2,434
Other Appalachian	1,821	1,861	2,534
Illinois, Indiana, and Michigan	10,904	11,214	11,012
Nebraska and North Dakota	3,015	3,519	2,568
Kansas	10,417	10,411	10,067
Oklahoma	20,441	20,749	24,747
Arkansas	2,341	2,457	2,870
Louisiana	19,258	19,737	17,467
North	3,045	3,126	2,632
South	16,213	16,661	14,835
Mississippi, Ala., and Fla.	2,538	2,681	2,948
New Mexico	9,917	10,043	9,148
Texas	128,103	126,464	127,181
East Texas	9,365	9,769	9,195
West Texas	59,555	59,614	62,158
Texas Gulf	25,356	24,854	23,876
Other Texas	33,827	32,227	31,952
Wyoming	15,145	15,634	16,970
Other Rocky Mountain	6,584	5,973	6,364
California	32,568	32,247	29,159
Foreign	†18,695	17,240	16,088
Total	284,878	283,314	291,557

*Bureau of Mines. †Includes 5,591,000 bbl. in California.

A.P.I. REFINERY REPORT—OCTOBER 25, 1957

(Thousands of barrels)

										Bureau of mines, October 1956				
	Daily	Daily average production				Stocks‡				Daily	Daily average production			
District—	avg. runs	Gaso.*	Kero.	Dist.	Resid.	Gaso.†	Kero.	Dist.	Resid.	avg. runs	Gaso.*	Kero.	Dist.	Resid.
East Coast	1,092	491.0	20.0	295.0	144.6	42,771	14,098	66,959	14,164	1,235	483.3	30.8	322.6	229.2
Appalachian:														
District 1	105	45.8	5.4	19.3	9.4	4,804	595	3,631	603	102	45.3	2.5	22.3	4.8
District 2	111	53.7	6.6	24.9	9.0	2,439	542	1,180	198	48	26.8	2.4	6.8	7.1
Ind., Ill., Ky.	1,371	746.7	74.0	267.7	161.0	29,946	7,348	25,309	6,134	1,271	662.9	53.8	254.2	139.9
Minn., Wis., Dak.	85	45.7	6.0	21.4	6.2	6,007	1,714	8,217	463	104	48.7	5.6	30.2	8.2
Okla., Kans., Mo.	695	392.0	11.6	159.3	27.3	14,630	1,901	14,497	1,137	728	405.0	11.8	160.3	28.1
Inland Texas	259	207.6	12.7	43.0	23.7	6,818	524	2,931	2,012	278	212.3	8.5	49.6	20.6
Texas Gulf Coast	1,769	894.3	105.1	463.9	186.2	24,581	3,906	20,456	7,960	1,854	904.1	77.6	471.7	241.6
La. Gulf Coast	597	344.6	35.7	158.1	41.4	11,627	3,022	8,995	1,414	668	361.1	45.5	169.0	45.3
N. La. and Ark.	66	37.8	4.6	19.1	4.4	4,264	1,086	2,051	208	97	34.7	5.6	22.4	6.7
Rocky Mountain:														
New Mexico	28	14.3	0.6	7.4	3.3	444	9	112	71	26	13.7	0.1	6.2	2.3
Other Rocky Mt.	261	126.3	2.1	63.0	34.4	5,179	348	3,055	994	285	134.1	2.1	61.4	34.6
West Coast	1,210	507.3	2.3	190.2	346.4	25,778	393	17,584	24,107	1,156	500.5	2.7	172.9	321.2
Oct. 25, 1957	7,649	3,907.1	286.7	1,732.3	997.3	179,288	35,486	174,977	59,465	7,852	3,832.5	249.0	1,749.6	1,089.6
Oct. 18, 1957	7,861	3,962.3	256.3	1,728.7	1,073.3	179,263	35,012	173,785	58,823	.....	.....	.....	.....	.....
Oct. 26, 1956	7,670	3,704.4	382.9	1,769.9	1,106.0	171,985	34,518	157,268	47,493	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.75-11.00
★ Regular (92 octane)	11.00-11.25
★ Premium (97 octane)	12.50-12.75
★ Premium (98 octane)	12.75-13.00
California (rack):	
Regular (88 octane)	12.9
Premium (96 octane)	14.9
Premium (98 octane)	15.4
Caribbean area (cargoes):	
★ Regular (87 octane)	10.625
★ Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$1.60-1.80
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour) (§)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.81
16-16.9	2.74	....	....	....	1.86
17-17.9	2.78	....	....	....	1.91
18-18.9	2.82	....	....	....	1.96
19-19.9	2.85	....	....	....	2.01
20-20.9	2.89	$2.75	....	$2.62	2.06
21-21.9	2.93	2.77	....	2.64	2.11
22-22.9	2.97	2.79	....	2.66	2.16
23-23.9	3.01	2.81	$3.44	2.68	2.21
24-24.9	3.05	2.83	3.46	2.70	2.26
25-25.9	3.09	2.85	3.48	2.72	2.31
26-26.9	3.13	2.87	3.50	2.74	2.36
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour. §Most buyers are posting Wyoming sour in two schedules, 15°-26.9° and 27°-40°.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta.)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.59
Iraq, 36.0°-36.9°, Tripoli, Banias	2.59
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON
(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—20%)	$2.28
★ Carib.-U.S.N.H., dirty (USMC—55%)	1.22
★ P.G.-France, dirty (USMC—60%)	4.36
Gulf-U.S.N.H., dirty (USMC—27.5%)	2.07

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GAS METERS FOR SALE: Westcott and Foxboro Orifice Meters, Large Stock of Late Types. Good Condition. George Milner, Box 124, Okmulgee, Oklahoma.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

COMPLETELY DEVELOPED and newly patented thread dope applicator. Tools and specifications available. Outright sale, or will consider manufacturers' license agreement to right party. Box K-387, The Oil and Gas Journal, Tulsa, Oklahoma.

POWER TUBING TONGS: Hillman-Kelley Model 3500 Air Tong outfit complete with LE ROI 85 Model 210-D trailer mounted compressor—2⅜", 2⅞" jaws and air hose. Ready to work. Excellent condition—$3,000.00. Terms if desired. Write or phone Bill Gotshall, EXpress 3-5411—Box 2556, Hobbs, New Mexico.

COMPLETE ROTARY SERVICING RIG FOR SALE CONSISTING OF:

Cardwell AH double drum unit powered by GM diesel engine mounted on 1952 White 22 tandem truck.
5 x 10 National pump skid mounted with International gasoline engine. Guiberson drilling head with kelly, hoses, subs, etc., Guiberson B.O.P., Guiberson air slips, B.J. Powermatic tubing tong and compressor trailer mounted. Van type trailer mounted dog and tool house, Kohler lighting plant and light string, 100 bbl. mud tank, all rod, tubing and swabbing tools.
Above unit is 3 years old, located in Western Canada. Price $30,000.00 with terms if desired.

Box K-405, The Oil and Gas Journal, Tulsa, Oklahoma.

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We have been taking up all our gas gas lines, owing to shortage of gas and have all the equipment for sale, which is as follows:

5,000' 6¼" i.d.
2,500' 5" i.d.
600' 6" o.d.
2,500' 4⅛" i.d. 4½" o.d.
5,000' 4¼" i.d. 4½" o.d.
2,500' 4⅛" i.d. 4½" o.d.
3,500' 3⅝" i.d. 4" o.d.
8,000' 4" i.d.
3,000' 3" i.d. 3⅛" o.d.

Above pipe is all bevelled and ready to lay and is good. Also,
1,000' 3" i.d. 3½" o.d. heavy C & T
3 miles 2" C & T. Also,
pipe fittings, gate valves, copper tubing and 60 meters from 60 B Metric down to house meters.

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Paola, Kansas

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CABLE TOOL RIG, 28L Bucyrus, five months old, has only drilled 6000' hole. Tools from 12½" to 5", Swabs, Packers, 3" Mud pump, Dog house, light plant and Two 1956 model Chevrolet Trucks. Priced to sell. Ph. RI 2-0453. Address 4216 South Oswego, Tulsa, Oklahoma.

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Valves & Fittings, ¼" to 72"
Big inch, Hi Pres.,—Gear & Motor Operated
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1 36L BUCYRUS Spudder complete with 5 and 7 inch tailing in tools. Dog house, butane tank, junk rack and light plant. Rod and tubing tools and hand tools. Phone Office 144, Res. 614, Cleveland, Oklahoma.

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3—Wyatt Bubble Cap Towers; 30"x20' 8 trays 50#, 2'x42' 22 trays 230#, 18"x23' 11 trays 200#
2—12' x 45' Storage Tanks, 25#.
1—14' x 31' Clay Tower, 125#.
1—8' x 75' Tower, 20 Trays, 25#.
1—18" x 32' Tower, 15 Trays, 160#.
1—8½' x 25' Tank.
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1—Poly Reactor, 550#, 24" x 28'.
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1—2' x 45' tower 24 trays.

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3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific SVTB, 621 gpm—600' hd. 324 gpm—480' hd, 308 gpm—316' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 gpm—408' Hd.
BJ hot oil pump, 3 x 9, 14 st, 324 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Flg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Steel Flg. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
6—Adm. 785, 742, 425 Sq. Ft.
2—4-6% Chrome 1,000, 500 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 LBS. 385 CFM 160 lbs.

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6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
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Tremendous selection stainless steel and steel valves 1½"-6".
Goulds 16" pump, 10,500 gpm, 135' hd.

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FOR SALE: One 1956 Model GMC 975 200" Wheel Base Tandem Truck with Tandem Float Braden Winch fully equipped, 9000 miles on speedometer. Also HD-15 Allis-Chalmers Tractor with Dozer and Winch. Good Equipment; Good Price. B. L. Rucker, Phone 1072, Box 127, Mt. Vernon, Ill.

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1—45 ST Star Spudder. 1—43 C Star Spudder. All equipt with drilling engines, 8" and 6" tools, floor sleds with half house, forge and tool sled, light plant, dog house and tools. $2,500.00 each. Call CH 2-2633 or RI 2-4025 Tulsa Write 222 Kennedy Bldg., Tulsa.

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FOR SALE: 1 Koehring Crawler Crane, Model 301, 40-foot boom, 10 ton capacity. Wisconsin Type RB, 5 x 6 gasoline engine. Price—$2,000. National Zinc Company, Inc. P. O. Drawer 579, Bartlesville, Oklahoma.

FOR SALE at Ponca City refinery, 1—slightly used M. W. Kellogg hydro-ejector for inserting and removing heat exchanger tube bundles. Price $1150.00. Cities Service Oil Company—Patridge—Bartlesville, Oklahoma.

FOR SALE: Hydraulic casing pulling unit, mounted on 2 ton Chev. truck. Fully equipped with tools, ripper, G.M.C. truck and Chev. pickup. A-1 condition. Priced reasonable. Jamison Bros., Madison, Kansas, Phone 80 W.

TWO COMPLETE RIGS—One 5,000' Wichtex drawworks, 7¼" x 14" Oilwell pump, 3 Buda JL1335 engines, 86' derrick, 2,000 gallon butane tank, shale shaker. One Brewster N-3 drawworks with 2 trucks and trailers, 6 x 12 Wilson-Snyder pump, 1 Waukesha GK145 and 1 Buda 8MO693 engine. 5,000' approximately 4½" drill pipe, 5 drill collars. Star Falcon Oil Company, Box 360, Oil City, Louisiana. Phone 6567.

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Large type 4½". 500,000 feet No. 1—12¾" O.D. ⅜" Wall 49.56 lbs. straightened machined cleaned, beveled ends, 20 and 40 ft. lengths.

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1 Main absorber, 5'x50'—631 psig. w.p., 20 trays.

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All above with reboilers and controls

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WICHITA FALLS 61 Spudder, Caterpillar 13000 Diesel Power, good working condition, price reasonable. Roy Barker Drilling Co., Box 664, McLean, Texas.

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FOR SALE: One 480 barrel welded tank, 12 feet by 24 feet Weight: 12,100 lbs. Bottom: ¼", Sides ¼". Built by Lincoln Tank Company in March, 1950. Contact Olin Calvin, P. O. Box 655, Olney, Texas.

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20" O.D. USED PIPE, 2800 ft., .312 wall single, random length Dresser Coupling ends. $2.95 ft., f.o.b. cars, Pittsburgh. G. N. Morrow, 217 Vernon Drive, Pittsburgh 28, Pa.

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COMPLETE 600 KW Generating Plant. 2—300 KW Worthington-G.E. Gas Engine Generating Units. 1—Nelson Electric Cubical Switchboard. 2—Happy Engine Coolers, all Auxiliaries. 1—Steel Building 36'x40'x12'. MAX E. LANDRY, INC. P. O. Box 2238, Tulsa, Phone RI 7-1394.

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1—10 HP Reda pump 480 ft. elec. conduit and 190 gallon pressure tank. 175 Brass Globe valves, used but good. Pump bought new, used only 10 days. RI 2-8698, Tulsa, Oklahoma.

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3,000' NEW 4½" P.E. 8.64# lap weld line pipe 44' average length. On rack Mt. Vernon, Mo. Western Mo. Gas Co. Box 447, Telephone 355, Iola, Kansas.

FOR SALE—Three RL Cardwell Spudders fully equipped. Located at Farmington, New Mexico and Kimball, Nebraska. Phone 15, Jess Nichols, Box 32, Geneva, Nebraska.

FOR SALE—24-L Bucyrus-Erie, truck mounted, lines, light plant & tools, 14,000' tubing & rods. O. H. Moore, Saint Marys, Ohio. Phone 5120.

FOR SALE at our Oklahoma City garage on SE 59th Street, 1—1950 Dodge P.W. truck on which is mounted Eli seismograph unit, 1600 series, 24 trace, Price $5,000.00. Cities Service Oil—Patridge—Bartlesville.

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WANTED 60 to 100 HP Single Cylinder Horizontal Gas Engine—Bessemer preferred. Quote price, condition and location. Keystone Pipe & Supply Company, Butler, Pa.

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DRILLING ENGINEER or Tool Pusher with long, thorough experience in all techniques of drilling, testing, and well completion, wanted by oil company operating in North Africa. Furnish full information on education, experience, salary. Box K-410, The Oil and Gas Journal, Tulsa, Oklahoma.

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Good opportunity for young graduate engineer interested in drilling and anxious to work and learn. Salary commensurate with qualifications and performance. Write for application to—

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Long established small but active independent, operating principally in Mid-Continent area, has opening with attractive future for qualified individual with approximately 8 years geological and/or petroleum engineering background and some administrative ability. Salary commensurate with ability and experience. Send full particulars to

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. . . with at least five years experience in marketing, including some experience or knowledge of refinery sales.

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with a natural gas processing company. Please submit resume of experience and indicate salary desired.

Write: Box K-372,
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Responsible for branch crew through technical foreman who supervises service and installations. Branch yard adequately stocked, conveniently located to assure prompt service and delivery. Compensation includes salary, plus bonus based on volume, expenses. Receives credit for all sales in territory including markets already established. Company provides life and health insurance, company car, paid vacations, extensive training at home office, reasonable moving expense to area, and excellent opportunity for advancement. For personal interview write letter of application giving detailed work history, education, age, marital status, address and phone. Write to:

SAUDER TANK COMPANY, INC.
Emporia, Kansas

HELP WANTED

MECHANICAL ENGINEER and/or Draftsman for design and development of oil field production equipment and ASME Code pressure vessel design. Experience required. Submit photograph, statistics, resume of experience, and salary required to Box K-414, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE ENGINEER with engineering and safety experience, preferably in refinery. Mid-Continent area with expanding company. Send photograph and complete personal history, including education, experience and salary requirement. Box K-409, The Oil and Gas Journal, Tulsa, Oklahoma.

ASSISTANT CATHODIC Protection Engineer for pipeline company headquartered in Los Angeles, California. Requires engineering degree and four years minimum related experience, or six to seven years experience without degree. Excellent employee benefits. Also positions available for junior engineers interested in cathodic protection field. Box K-398, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, Ph.D., 34, speaking English, French, German, Italian, wishes to become sales representative for oil or mining equipment manufacturers, service companies, oil, ore, metal, chemical, related industries in Europe and Eastern Hemisphere. Box K-395, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Geological Engineering degree. 4 years interpretative experience, party chief. Familiar with magnetic taping techniques. Wants employment with an independent Oil Co. to coordinate Geology-Geophysics. Box K-393, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLOITATION GEOLOGIST

Stanford graduate, expert subsurface analyst. Geologist-engineer-geophysicist combination desires permanent position with major oil firm. Well experienced for any type development problems, foreign or domestic. Have passport—will travel. Write

Box K-413, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOR SALE

CAN DELIVER 1,000 to 5,000 bbls. crude oil daily, low grade or regular in tank cars or in pipe line at Wyoming points. Producer, P. O. Box 2362, Denver, Colorado.

PRODUCTION WANTED

PRINCIPALS want sizeable producing oil, gas properties. Prompt action. Strictest confidence. Box 231, Scarsdale, N. Y.

WANTED: Oil properties, 100 to 5,000 barrels daily in Oklahoma and Kansas. Morris Sitrin, P. O. Box 1160, Tulsa, Okla.

Oil Production

Proven production of 200 bbls. to 6,000 bbls. daily wanted by substantial independent. Location not important. Principals only.

Call CH 4-2036,
Denver, Colorado

SITUATIONS WANTED

GEOLOGIST: four years paleontologic and stratigraphic, subsurface experience. Could organize paleontologic laboratory. Foreign or domestic. Box K-396, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: B.S., M.S. Geophysics, desires position as interpreter, seismologist, or supervision seismic crews. Six years experience, mainly Rocky Mtns., some Texas, New Mexico. Box K-392, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT, 39, experienced oil production accounting, office management, lease billings, oil taxation. Wants position with independent producer. Will relocate. Details given on request. Box K-391, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST—Interpreter and interpretation supervisor ten years with major company, wide experience, speaks Spanish, excellent references, desires position in South or Latin America. Box K-385, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY ENGINEER: 8½ yrs. experience with mechanical equipment (maintenance & construction) in refinery, pipeline and terminal work. U. S. or foreign. Box K-397, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER—Registered—Age 34—Power and utilities, waste disposal, water treatment, process engineering, operations analysis, job and personnel studies. Excellent relationships with management and employees at present location. 9 years with major oil company in medium sized refinery. References and experience summary on request. Box K-404, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER: 6 years varied experience; completions, workover, acidizing, fracturing, and perforating. Desires domestic employment. Box K-415, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER, seven years broad production experience including new development, workover, secondary recovery, presently in supervisory position desires change. Box K-403, The Oil and Gas Journal, Tulsa, Oklahoma.

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ElectroData Appoints J. T. Allen to Dallas . .

district as field engineering supervisor, according to J. F. Kalbach, field engineering manager of ElectroData division of Burroughs Corp.

Allen is responsible for installation and servicing of ElectroData equipment in the Dallas area. He joined the firm in 1956, after serving as an electronic computer customer engineer and an installation technician.

Ever-Tite Coupling Opens West Coast Office . .

in Long Beach, Calif., as part of its national setup for sales and service. Ralph W. Lohse, recently appointed West Coast manager, will be in charge and will serve Ever-Tite Coupling Co. customers in eight western states.

This new office will interrelate its activities with Ever-Tite's midwestern office in Cincinnati and main office in New York to expedite orders and deliveries.

G. E. Montgomery Named Universal's Sales Manager

Previously a salesman with Universal Packing & Gasket Co., his experience includes 2 years as the company's California representative and several years handling OEM and industrial accounts in the Houston and eastern territories.

Montgomery has been associated with the packing business in manufacturing, engineering and sales capacities for 25 years.

Avondale Marine Ways, Inc., Appoints G. F. Crozier . .

sales engineer in the new industrial contracts division. This division will acquaint present and potential customers with the facilities, capacities, and production tools available to refining and other industrial clients.

LEGAL

Sealed Bids will be received until 10:00 A. M., Mountain Standard Time, and opened at that time in the office of the Navajo Indian Agency, Window Rock, Arizona, for oil and gas leases, on 190 tracts of tribal lands, and 7 tracts of allotted lands, totaling approximately 381,530 acres of tribal lands, and 1,040 acres of allotted lands, located in San Juan County, Utah, and Apache County, Arizona, as follows:

	Bids to be Opened:
Block 1:	
Tracts 1 through 33, Utah	12-10-57
Block 2:	
Tracts 34 through 54, Utah, and Tracts 55 through 109, Arizona	1-15-58
Block 3:	
Tracts 110 through 128, Utah, and Tracts 129 Through 160, Arizona	2-11-58
Block 4:	
Tracts 161 through 174, Utah, and Tracts 175 through 197, Arizona	3-19-58

Details of the lease offering and filing of bids may be obtained by addressing an inquiry to the General Superintendent, Navajo Indian Agency, Attention: Branch of Realty, Window Rock, Arizona.

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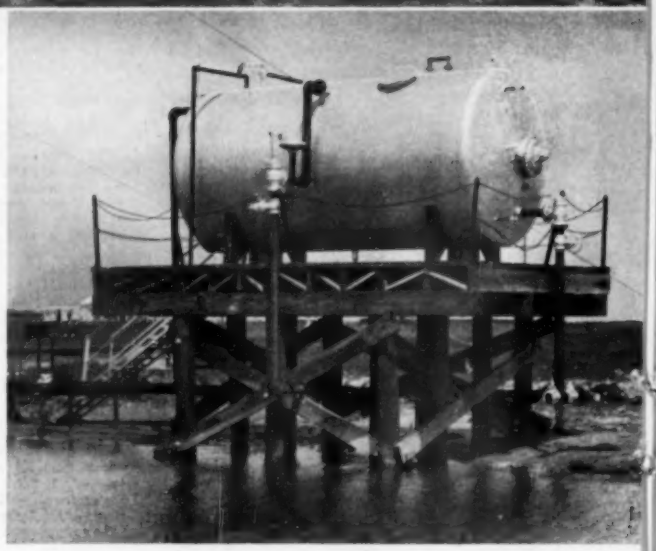

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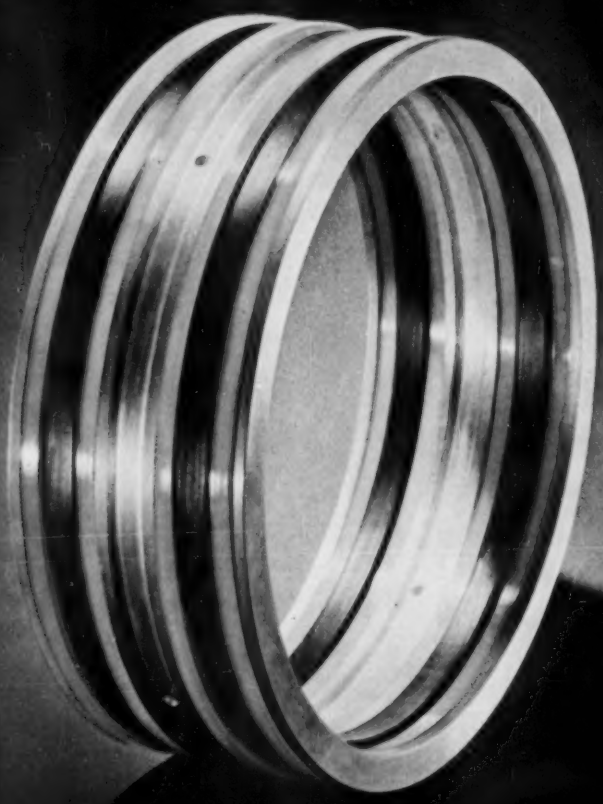

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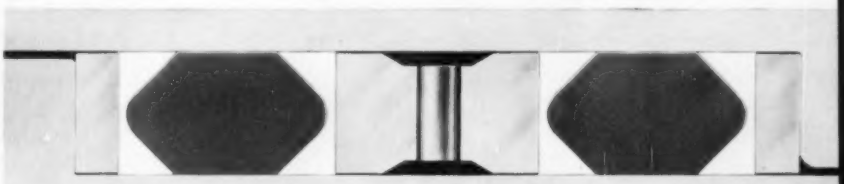

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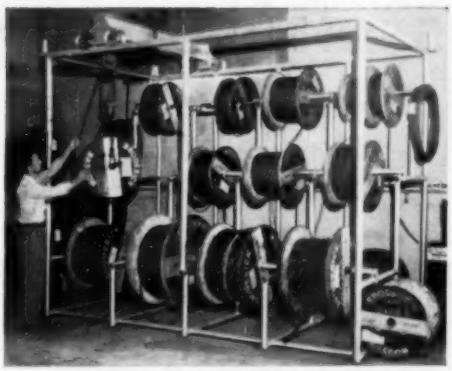

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